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A Multidisciplinary Perspective of Big Data in Management Research

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ABSTRACT

In recent years, big data has emerged as one of the prominent buzzwords in business and management. In spite of the mounting body of research on big data across the social science disciplines, scholars have offered little synthesis on the current state of knowledge. To take stock of academic research that contributes to the big data revolution, this paper tracks scholarly work's perspectives on big data in the business and management domain over the past decade. We identify key themes emerging in management studies and develop an integrated framework to link the multiple streams of research in fields of organisation, operations, marketing, information management and other relevant areas. Our analysis uncovers a growing awareness of big data's business values and managerial changes led by data-driven approach. Stemming from the review is the suggestion for research that both structured and unstructured big data should be harnessed to advance understanding of big data value in informing organisational decisions and enhancing firm competitiveness. In light of these, the study identifies and outlines the implications and directions for future research. To discover the full value, firms need to formulate and implement a data-driven strategy.

KEYWORDS: Big data, Management research, Literature review.

1. <u>INTRODUCTION</u>

For years, big data has been one of the biggest buzzword. In the age of the Internet of Things, data is everywhere and the term "big data" represents a large data pool with significant variety and complexity (Manyika et al., 2011). People are getting interested in big data, especially starting from the year 2011, according to the statistics of popularity for this term on Google Search (see Figure 1). The hidden value of big data attracts scholars' attention too. Searching the term "big data" on Google Scholar returns millions of results, which span multiple disciplines, such as computer science, engineering, and social sciences.
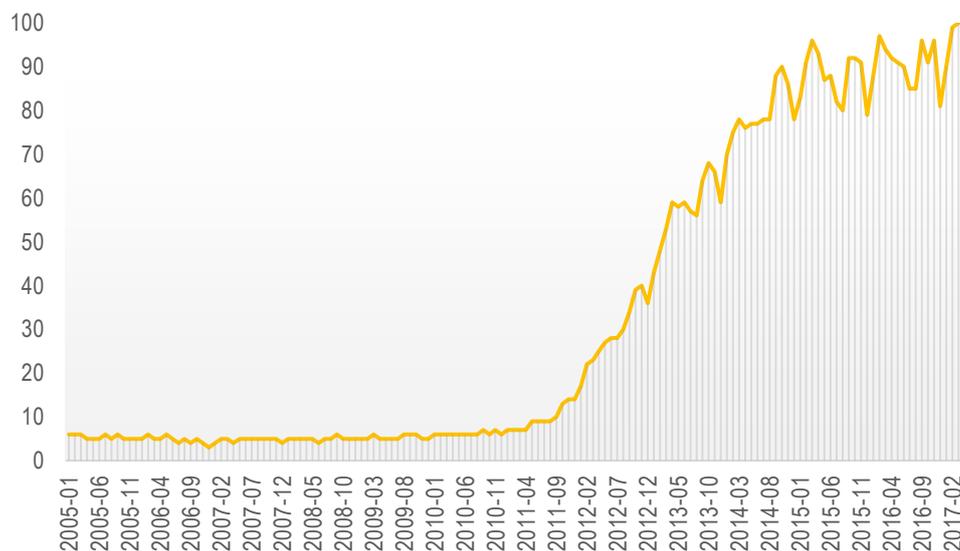
Notes: The statistics shows worldwide search interest of the term over the period from 2005 to March 2017.
Source: Google Trend.

Figure 1. Popularity of Term "Big Data" on Google Search

On top of technological attempt on improvement, practitioners and academics have been exploring further implications of big data for business and other applicable fields (e.g. Akter, Wamba, Gunasekaran, Dubey, and Childe, 2016; Erevelles, Fukawa, and Swayne, 2016; Wamba et al., 2017). Big data has not only transformed the business models but also paved the way for organisational strategic decision-maker to act in a timely manner (Beath et al., 2012; McAfee and Brynjolfsson, 2012). Past studies have demonstrated the value of big data in enhancing productivity

and creating social surplus (Manyika et al., 2011). It has also facilitated making decisions with better accuracy based on solid data evidence rather than intuition (McAfee and Brynjolfsson, 2012). Nonetheless, facing the sheer amount of data and greater complexity, how to create value from big data remains to be the primary challenge to businesses. Along with the changing business environment, organizations should enhance their adaptability and dynamics by developing a data-driven management mechanism to grasp the opportunity to create values from big data. However, our understanding of how big data value has been achieved and will be achieved is still limited.

Despite the growing recognition of the importance of big data across industries and sectors (Gandomi and Haider, 2015) and the mounting body of knowledge (McAfee and Brynjolfsson, 2012), there is limited synthesis of the literature across the social science disciplines. It remains unclear what social science scholars have discussed in the past decade to address big data issues and what knowledge has been discovered to advance our understanding around big data analytics. Indeed, the lack of clarity in current research on big data stems from a lack of a comprehensive review of past studies to clarify boundaries of the subject and progress made by scholars (Sivarajah et al., 2017). Furthermore, the lack of interdisciplinary research review may have obscured past accomplishments leading to lack of clear directions for future research. Against this backdrop, the main purpose of this study is to review the literature on big data in business and management research, in order to identify the key themes in current big data research and clarify the research frontiers. The review intends to serve as a reference point to advance big data research in management fields.

The article offers several contributions to big data and management research. First, a few scholars have suggested that an integrated approach to big data can enhance our understanding of the subject (see Amankwah-Amoah, 2015, 2016), but to date the literature remains scattered across disciplines. In this direction, our paper contributes to the literature by offering a comprehensive review of the literature, which clarifies the complexities of the subject, management applications of big data,

current trends and themes identified by past studies. Second, building on past studies (Chen, Chiang, and Storey, 2012; Sivarajah, Kamal, Irani and Weerakkody, 2017), the paper synthesises the literature from various perspectives in business and management, highlighting primary concerns in each academic field. In so doing, we outline the linkages between the approaches adopted by scholars in areas such as organisation, operation, marketing, and information management with regard to big data application. This work extends prior big data research by developing an integrated framework to link the current disjointed streams of research. In addition, by explicating the mechanisms and approaches adopted by scholars, we outline an approach towards better utilisation of big data in business and management domain. We are confident that our review provides a valuable contribution to this evolving and important research field and will serve as a platform for future research efforts in this area.

The rest of paper is organised as follows. The next sections outline the evolution of big data research and clarifies the scope of this review. This is then followed by development of an integrated framework drawing on various management perspectives. The last section discusses research gaps and promising avenues for future research.

2. EVOLUTION OF BIG DATA

2.1 What is Big Data?

Some scholars have suggested that big data is a "moving definition" which varies with time as well as industrial sectors (Manyika et al., 2011, pp. 1). There is no fixed threshold set for measurement of what size and type of data can be treated as big data, given that the amount continues to increase. Indeed, the quantification of data takes different forms and different datasets may generate depending on various analytics forms. Although there is no universal definition of big data, there appear to be an emerging consensus about its uniqueness that distinguishes big data from what we recognise large database is like in traditional acknowledgment. Three Vs of big data, namely volume, variety and velocity, has been introduced at an early stage of the development of this

notion (see Laney 2001; Kwon et al., 2014; Russom, 2011), which reflect the continuous expansion of data in terms of multiplicity.

In addition to scale expansion, big datasets are far more complicated. Data is generated and collected from more diversified sources such as web sites, smart devices and social media. Moreover, data variety is greater because data comes in all types of formats. Structured data is no longer the only type we recognised, rather more unstructured and semi-structure data are identified as conveying abundant useful information. Furthermore, torrents of data are coming in near-real time. The speed of data generation and data delivery become critical elements in big data especially the high-frequency streaming data in real-time decision-making. Additional characteristics of big data including high value and low veracity (see Gandomi and Haider, 2015; Katal et al., 2013) have further enriched the conceptualization of the big data nature. The 5Vs definition of big data pinpoints the complexity that businesses are confronted by to create real value from big data.

Given the confusions over big data concept, we define big data as extremely large amount of structured, semi structured or unstructured data continuously generated from diversified sources, which inundates business operations in real time and impacts on decision-making through mining insightful information from rambling data. For research clarity, what constitutes big data in this study include large structured datasets and unstructured data in the form of text (e.g. documents, natural language), web data (e.g. web structure, web usage, web content), social media data (e.g. virtual network), multimedia data (e.g. image, audio, video), mobile data (e.g. sensor, geographical location, application).

2.2 Big Data in Practice

In real-world practice, the abundance of big data accelerates technology improvement. In recent decades, more advanced platforms and systems have been invented and employed to handle big data, which have advantages compared to traditional techniques in every aspect of data management

and analytics. Russom (2011) foresees a future trend towards a growth in the adoption of visualisation, in-memory databases, SQL and other advanced analytics techniques in corporate IT commitment. As big data expands, emerging techniques will become more in demand as these advanced programs have stronger functions and flexibility, which makes business analytics more cost-effective and efficient.

Nowadays, big data analytics has become a trendy practice in business intelligence encompassing combination of massive data sets and advanced analytics techniques, and it plays a role in influencing aspects of business activities and customer choice (Russom, 2011). With extensive amount of data collected and interpreted, companies are able to identify the competitions and respond to customers' requirements. The majority of the global economies and business activities are expected to be involved in some kind of big data transformation (McAfee and Brynjolfsson, 2012). The diversity of big data has been regarded as "enterprise assets" which can "yield actionable business insights" (Russom, 2011, pp. 9). With better accuracy in prediction based on solid data evidence instead of intuition and experience, the data-driven approach is capable to improve business performance (McAfee and Brynjolfsson, 2012). With promising development and technological support, big data is becoming increasingly needed and emphasised in modern business operation. Indeed, there is strong evidence indicating data is an essential element for firms seeking to gain competitive advantage (Brown et al., 2011). It has potential to play a significant role in countries' development, academic research, and the way people see the present and the future world (Jin et al., 2015).

Within organisations, managerial perceptions and process are also changing along with a data-driven decision-making strategy, which leads to changes in organisational culture, leadership, human resource management and other management practice (Davenport, 2014; Rifkin, 2014). Moreover, significant impacts of big data can be seen in strengthening customer relationships, lowering management risk, improving operation efficiency, which leads to more effective

marketing strategies and operation management to gain competitive advantages (Kiron and Bean, 2013).

Facing great potential of big data, a clear path towards business and management improvement is an urgent need. By revealing current research state and issues addressed in prior studies, this paper seeks to identify the big data evolution in management academia and fruitful future research opportunities. For researchers and practitioners, the emergence of big data has led to greater enthusiasm for 'discovering the strategic uses of large database' (Bollier and Firestone, 2010, pp. 1). A growing number of publications and industrial reports addressing business intelligence, business analytics, and big data issues have emerged. Nonetheless, there remains considerable research space to address big data challenges, particularly in the aspect of linking big data with application disciplines in knowledge economy and management domain.

3. <u>METHOD AND SCOPE OF THE REVIEW</u>

3.1 Research Method

The present study explores the various ways in which big data has been discussed and applied in the management literature in order to identify key themes in current research. Given that the term big data in the modern sense was coined in 2005 (Halevi and Moed, 2012; Magoulas and Lorica, 2009; Ularu et al., 2012), this review collected papers published since then), this review collected papers published since then. The initial inclusion criteria were peer-reviewed English articles published in prestigious academic journals in the management fields with a focus on big data conceptualisation or application.

In order to capture wider coverage of the existing literature, we followed the approaches used by Chen et al. (2012) and the best literature review approach (e.g. Short, 2009; Webster and Watson, 2002). We started by using the key word "big data" for searching to gain a macro-level view of the amount and relevance of studies. Following the identified types of data analytics in Chen et al.

(2012), the scope was widened by searching "big data analytics", "text analytics/analysis", "web analytics", "social media (analytics)", and "mobile analytics". A database search was conducted to find articles that contained the above key terms in their title, abstract, or keywords. The databases used include Business Source Complete, Informs, ScienceDirect, JSTOR, Springer, Emerald and Wiley.

The initial search yielded a large number of articles in the broad area of big data. We carefully scanned for relevance and used combinations of keywords (e.g. "big data" and "text analysis") to exclude studies that were not closely link or utilise big data. In total, over 300 articles that had a clear focus on big data with management implications were selected for further analysis. We then read and examine the selected articles in details. The final sample includes 285 articles.

All sampled articles were downloaded and analysed. We recorded the authors, year, titles and journals of publications. Each article was coded according to several predetermined variables, such as type of research paper (e.g. empirical, conceptual), subject of journals (e.g. general management, marketing), and analytics category (e.g. big data analytics, text analytics) in order to describe the characteristics of the sample. By analysing the content, we also identified the specific topic and application area each article focused on. Perspectives of big data research in the organising framework in the next section were identified and classified based on the extracted information.

3.2 Big Data in Business and Management Research

3.2.1 Distribution of articles by year of publication

With regard to timeline, scientific research around "big data" started to gain prominence this century. Majority of studies on the subject were conducted within technology-related disciplines, while the discovery of big data's business implications somehow lagged behind. However, the analysis shows a growing number of publications addressing big data issues in the management community. The selected articles in this study are published during the period from 2005 to early

2017. As illustrated in Figure 2, management-related research on big data grew exponentially over the review period, especially after the year 2011. This is in line with the upward trend of the overall interest in the term "big data" in the past decade.
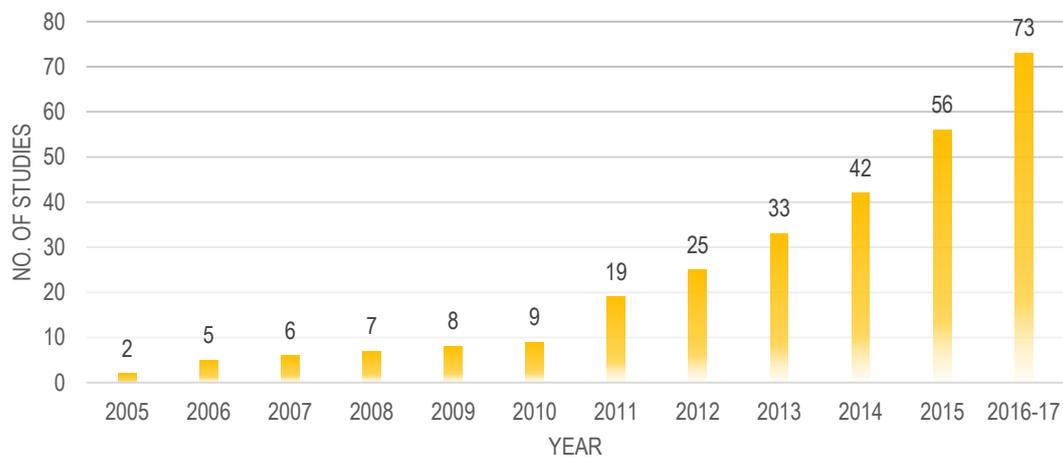

Figure 2. Distribution of Articles by Year of Publication

3.2.2   Distribution of articles by research paper type

The type of papers is classified based on the primary research methodology used in the studies. In this review, it is found that empirical and modelling studies take up the majority, while only a small portion doing conceptual and qualitative analyses. Empirical studies investigate specific questions and analyses data relying on observation and experimentation, while modelling papers aim to improve existing systems and propose new approaches. As show in the first chart in Figure 3, these two methods are adopted in 84% papers of total. For the rest, 10% are theoretical and conceptual papers, which discuss issues centred on the topic and contribute to development of theoretical frameworks. Literature review and case study account for only a small minority (6% together), with a focus on research or organisations that apply big data approach. The distribution reveals the importance of solving technical issues at a fundamental level of the development in this area. It is reasonable as the rise of big data is meant to optimise data-driven concepts and approaches. Once the big data techniques are loud and clear, it leads to investigation into business related issues to realise business values and inter-organisational changes. Then a complete system of big data in

management research is expected to be built and advanced based on the practically applicable models and theoretical frameworks.

3.2.3 Distribution of articles by subject

Regarding the distribution of articles, we identified eight broad subject areas, namely general management, information management, marketing, operation research and management science, organisation, sector study, public sector study and others. This classification is based on the journal in which the article published and the subject that the journal belongs to in the Academic Journal Guide 2015 (the Association of Business Schools, 2015). Among the reviewed papers, 46% relates to information management subject (see the middle chart in Figure 3). This may stem from the fact that information management is more data and technology-based, which accords with the nature of big data. Most of these papers seek to introduce or improve approaches to process data with different analytic and managerial goals. In addition, marketing (18%) and operation research (17%) have also published considerable amount of papers, exploring the effectiveness of big data driven approach in marketing activities and operational practices. Meanwhile, there are relatively few articles in current studies considering big data from an organisational (7%) or broader managerial perspective (10%), emphasising the strategic importance of big data. This indicates an imbalance among different subjects, and big data research remains underexplored in several management areas.

3.2.4 Distribution of articles by analytics category

The study uncovered that scales of structured and unstructured data can be used in analytics to improve management effectiveness. Unstructured data appeared in present studies include text data, web and multimedia data, social media data, mobile and sensor data. Based on what data each article analyses or what analytics it focuses on, we categorise the selected papers into six types, namely big data analytics, text analytics, web analytics, multimedia analytics, social media analytics, mobile analytics (see the last chart in Figure 3). An important fact demonstrated from the statistic is

that unstructured data becomes attractive to researchers in recent years' study. In our sample, 18% of papers discuss big data analytics in general or analyse large-scale structured data, while the remaining emphasises the importance of unstructured data in management application.
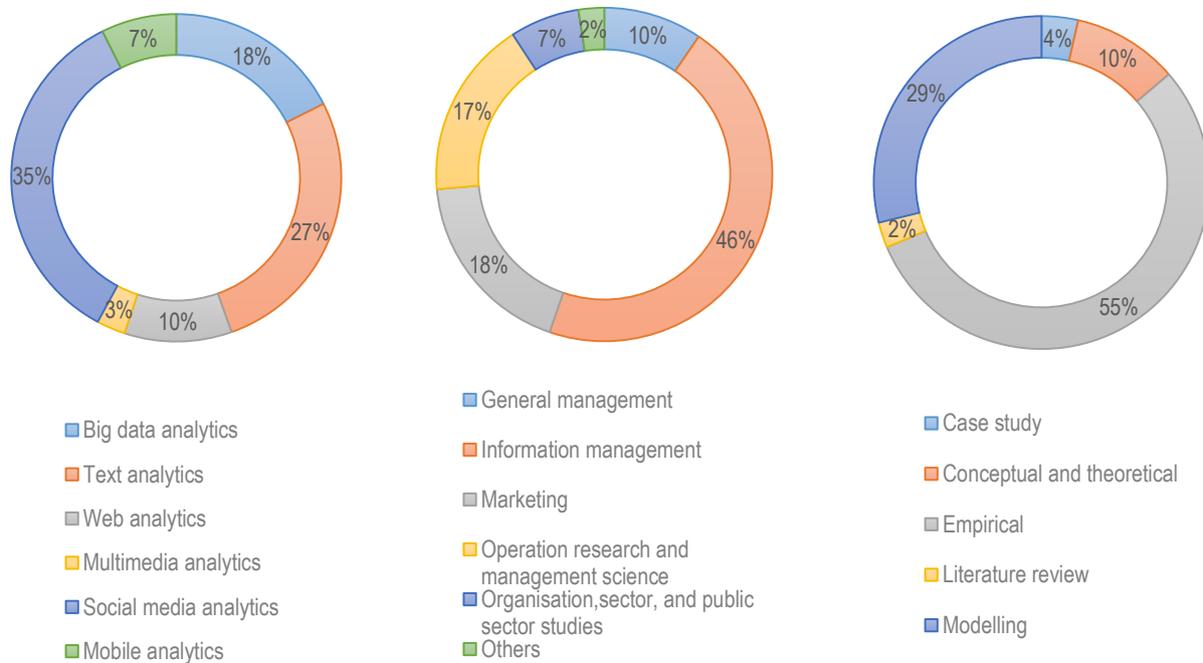

Big data analytics
Text analytics
Web analytics
Multimedia analytics
Social media analytics
Mobile analytics

General management
Information management
Marketing
Operation research and management science
Organisation, sector, and public sector studies
Others

Case study
Conceptual and theoretical
Empirical
Literature review
Modelling

Figure 3. Distribution of Articles by Research Type, Subject, and Analytics Category

Text analytics is a prominent area (27%) with proposing methods to extract and analyse textual data. 99 articles (35%) are related to social media, where social networks deliver insightful messages. The fact that text analytics and social media analytics are more popular may stem from easy accessibility of the data sources such as social media platforms, websites, and blogs. Indeed, there is some overlap between these two types as textual data is one main form of social media data. In general, most text-based analysis aims at technical improvement, knowledge discovery and opinion mining, while social media related studies further concern human behaviour, social influence, and digital business issues.

In addition, web analytics is a likewise hot topic, with 10% of papers addressing web mining and other Internet-based issues using web logs, clickstream, web pages and other data. In contrast, alternative types of data such as multimedia, mobile and sensor data are rarely seen in literature.

There are 21 articles (8%) in our sample covering mobile analytics issues, while multimedia data is even rarer in our observation with only 8 articles relevant (3%). These data are also being generated and collected in a tremendous scale. Nevertheless, it is yet not clear for management researchers and practitioners how to use them effectively.

4. BIG DATA: AN ORGANISING FRAMEWORK

The present study indicates that there are various perspectives to see big data issues in the management community, including organisation, operations, marketing and information management. To deepen our understanding of the vast literature, a content-oriented classification is applied to capture article themes with a few paradigms. The clustering of literature is based on the specific topic and application area of big data that each article spotlights. This information is extracted and coded from article keywords and further analysis of the whole study. All codes generated are then grouped into 25 categories, where each category indicates the central topic of the articles, or the main application area the studies aim for. There upon all categories are further organised into five main perspectives, from which business and management researchers are looking into big data issues in the existing literature. We then investigate what problems have been addressed within each perspective and key findings from their studies. Table 1 presents the summary of all the reviewed articles and the classification scheme in this paper.

Table 1. Distribution of Articles by Topic and Application Area

Perspective	Topic and application area		No. of studies	
Organisation	Organisation strategy	Business intelligence	20	
		Strategic management	7	
	Organisation management	Organisational change	5	
		Organisation engagement	8	
	Human resource management		7	47
Operation and production	Operation management	Operation process	7	
		Production and innovation	6	
		Operation research	1	
	Supply chain management		10	24
Marketing	Consumer behaviour	User behaviour	18	157

	Consumer sentiment	Online community	6	
		Social network	7	
		Online review	28	
		Online rating	7	
		Sentiment analysis	23	
	Marketing strategy	Advertising and targeting	17	
		Brand analysis	12	
		Electronic word-of-mouth	15	
		Market analysis	12	
		Recommendation	12	
Information management	Technique and analytics issues		31	31
Others	Accounting and finance		8	
	International business		2	
	Public administration		12	
	Others		4	26
Total			285	

The clustering of articles reveals a disperse distribution among different subjects. First, understanding consumers seems a primary direction in present research. These studies mostly involve analysing text, social media data, mobile and sensor data for marketing and operation purposes. Consumer sentiment and behaviour are examined in various ways, taking into account of social influence and specific natures of online shopping environment. Second, from a strategy perspective, prior studies explore the strategic use of big data in the digital business environment. New strategies in marketing, operation and other areas are attempted to improve business efficiency. A handful of papers overview big data's impact on strategic decision-making, and the changes it leads to organisation management and organisational functions are also discussed.

Third, papers in information management field mainly deal with analytics techniques and technological issues. It helps improve information retrieval and data process with better accuracy and efficiency, and therefore support research needs in other management fields. Moreover, operation management, production and innovation, supply chain management are investigated in several researches. A primary goal of these studies is to enhance operation efficiency and effectiveness by leveraging information delivered by big data. In addition, from other aspects,

though seldom, scholars in accounting, international business, public sector study and other areas turn their attention to big data's potential for creating values so as to advance research in data rich future.

4.1 Organisation Perspective of Big Data

The organisation studies' perspective on big data examines the organisation alignment with data-driven strategy in every aspect of organisational structure, culture, operation, and functions. It emphasises the potential changes in organisational ecosystem and management process under the influence of big data strategy. Table 2 summarised articles taking this perspective.

Table 2. Organisation Perspective of Big Data

Organisation perspective		Studies
Organisation Strategy	Business intelligence and firm performance	Akter et al.(2016); Castellanos et al.(2012); Chen et al.(2012); Côrte-Real et al.(2017); Dutta and Bose(2015); Erevelles et al.(2016); Gupta and George(2016); Janssen et al.(2017); Luo et al.(2013); Martens et al.(2016); Matthias et al.(2017); Menon and Sarkar(2016); Ren et al.(2016); Sabnis and Grewal(2015); Sivarajah et al.(2017); Toubia and Netzer(2017); Vila and Gomez(2016); Wamba et al.(2017); Xie et al. (2016); Xu et al. (2016)
	Strategic management	Bharadwaj et al.(2013); Bhimani(2015); Opresnik and Taisch(2015); Saboo et al.(2016); Wamba et al.(2015); Woerner and Wixom(2015); Yuan et al.(2016)
Organisational management	Organisational change	Braganza et al.(2017); Gunasekaran et al.(2017); Kiron and Bean(2013); McAfee and Brynjolfsson(2012); Orlikowski and Scott(2014)
	Organisational engagement	Dellarocas (2006); Dijkmans et al.(2015); Gu and Ye(2014); Hu et al.(2012); Ibrahim et al. (2017); Miller and Tucker(2013); Tripp and Grégoire(2011); van Noort and Willemsen(2012); Vermeulen and Seegers(2009)
Human resource management		Kluemper and Rosen(2009); Lam et al.(2017); Marcus et al. (2006); Roth et al.(2013); Shah et al.(2017); Tambe (2014); Van Iddekinge et al.(2016)

4.1.1   Organisation strategy

From an organisational strategic perspective, present researches discuss the impact of big data on business intelligence and strategic management.

Business intelligence. Bollier and Firestone (2010) points out that big data provides numerous interesting correlations, among which the significant correlations can be used to discover and establish the causality with models. For instance, firm performance in a competitive environment is significantly correlated to user-generated content (Sabnis and Grewal, 2015), and in another way around, social media metrics significantly indicate firm equity value with stronger and faster predictive relations than traditional online behavioural metrics (Luo et al., 2013). Such business intelligence is acquired by performing big data analytics, which combines big data with advanced analytics techniques to extract valuable insights from big data (Chen et al., 2012). It advances a firm's business intelligence capability, for example, streaming unstructured web data in near real time improves enterprises' situational awareness thus operational business intelligence (Castellanos et al., 2012). Indeed, big data analytics is becoming an essential element in organisation for gaining success (Dutta and Bose, 2015). It endows firms with advanced business intelligence capability (Castellanos et al., 2012; Chen et al., 2012) and insights from big data metrics are more rigorous (e.g. Bollier and Firestone, 2010; Luo et al., 2013; Sabnis and Grewal, 2015). Decisions enlightened by big data can be more effective with greater flexibility and promptness (e.g. Bhimani, 2015; McAfee and Brynjolfsson, 2012; Wamba et al., 2015).

Strategic management. A parallel interest in the subject has emerged among strategy scholars. Hitt, Ireland and Hoskisson (2011, pp. 6) defined strategic management as "the full set of commitments, decisions, and actions required for a firm to achieve strategic competitiveness and earn above-average returns". From strategic management perspective, big data is increasingly admitted as enterprise assets, which is critical to organisational success (Russom, 2011; Dutta and Bose, 2015). The strategic management perspective on big data focuses on how resources and capabilities are

assembled and utilised to help firm make quality future and long-term decisions (see Hitt et al., 2015; Ireland et al., 2012). Big data analytics has great impact on strategic process and improves consequent decisions by providing new data, insight and action. Especially big data shows a broader view on the information flow that comprehensively reflects the potential changes in business operation in real-time (Bhimani, 2015). Thus, it enables executives to extend their knowledge about the business and enhance the effectiveness and flexibility of strategic decisions in a timely, efficient manner (McAfee and Brynjolfsson, 2012).

Moreover, big data can improve business model innovation through data monetisation and digital transformation (Woerner and Wixon, 2015). For example, digital business strategy, a fusion between IT strategy and business strategy, may have greater insights by considering its scope, scale, speed and sources of such strategy (Bharadwaj et al., 2013). More importantly, the profound impact of big data is expected to be seen on organisational strategic transformation (Provost and Fawcett, 2013), and it may reshape the operational mechanism within the organisation as well as its strategic actions (Beath et al., 2012; Mayer-Schönberger and Cukier, 2013). With such data-driven business models emerging, it requires organisation to embrace big data and adopt advance information system to improve the effectiveness and flexibility of decision-making process to achieve better performance (Wamba et al., 2015).

4.1.2 *Organisational management*

Organisation change. Within an organisation context, adopting big data-enabled decision-making strategy has made great influence on organisational management (Rifkin, 2014). Such change is achieved via 'transforming processes, altering corporate ecosystems, and facilitating innovation' (Brown et al., 2011, pp. 26) and it has already generated new managerial perceptions. Undoubtedly, there will be a transition of managers' views on "the value of experience, the nature of expertise, and the practice of management" (McAfee and Brynjolfsson, 2012, pp. 4). Kiron and Bean (2013) also point out that data-driven decision-making is a promising trend and the primary factor

attributed to successful big data utilisation is the organisational alignment in every aspect in the companies. Entrepreneurs are encouraged to seize the great opportunities by making strategic adjustment within the organisation. Great transparency and accessibility of data is required, so as technological innovation becomes an essential element to support organisational decisions with sophisticated algorithms.

Organisation engagement in social media. Personal interactions over the social media become more frequent with greater demand. Firms tend to use social media as a platform to promote and deliver information to audiences. Dijkmans et al. (2015) demonstrate that corporates' online activities encourage consumers' social media use, which can enhance corporate reputation especially among non-customers. Miller and Tucker (2013) also find incremental engagement with social media of client and employees when organisations actively managing their social media presence. However, it is unclear how active firms should be in engaging with consumers through social media. Several studies start with exploring the effectiveness of managing social media on firm performance and customer satisfaction though participating online communication (Gu and Ye, 2014; van Noort and Willemsen, 2012; Vermeulen and Seegers, 2009).

4.1.3   Human resource management

This perspective on big data focuses on how human resources and performance can be improved or enhanced using big data. This includes performance evaluation, training and development, staff utilisation and skills formation (see Scullion and Linehan, 2005). As an organisational function, human resource management (HRM) has been examined within big data context from three aspects. The primary view is using social media to assist personnel decisions. For instance, in the frontline recruitment, more insights of the potential hires can be revealed through looking at social media profiles and online professional network. Besides, workforce data can be also adopted to assess employee performance, which can deliver more informed solutions to talent management, staff engagement and productivity enhancement. The use of social media in corporate HRM practice has

been recognised by Roth et al. (2013) as of great importance for organisation, individual and society, which needs further research. Nonetheless, whether social media information of job applicants is critical in recruitment selection remains to be a question, as some research regards it as irrelevant and invalid (van Iddekinge et al., 2016).

Besides, as big data requires advanced data analytics skills, HRM is expected to function in a different way in talent management. Expertise in data management and analytics is in great need, and Tambe (2014) illustrates that labour with technical skills together with big data investment are necessary attributes to productivity growth and development, which leads to changes in strategic workforce planning. Moreover, leadership is expected to change with active engagement in developing strategic orientation and data-driven operation.

According to Gerhardt et al. (2012), business leaders should engage in the entire big data ecosystem to earn more benefits from sharing information to the external of the organisation. Within organisational study, attention has been paid mostly to the adaptation of various functions in an institution to the data-driven environment and approach. To further develop the understanding in this area, more specific action plans are expected to guide the process of organisational alignment with big data in aspects of culture, management functions and operations. Going beyond the conceptual roadmap, empirical evaluation of new approaches in HRM and other activities remains to be done in the future.

4.2 Operation Perspective of Big Data

From a business operation perspective, big data has been explored in a way to improve production and operation efficiency. In operation and production field, there are few studies and current research interests are mainly laid on the following topics (see Table 3).

Table 3. Operation Perspective of Big Data

Operational perspective	Studies

Operation management	Operation process	Aloysius et al.(2016); Chan et al.(2016); Guo et al.(2014); Huang and Van Mieghem(2014); Kumar et al.(2016); Li et al.(2015); Zhong et al.(2015)
	Production and innovation	Abrahams et al.(2015); Chan et al.(2016); Jin et al.(2016); Mount and Martinez(2014); Qi et al.(2016); Zhan et al.(2016)
	Operation research	Mortenson et al. (2015)
Supply chain management		Chae(2015); Chen et al.(2015); Groves et al.(2014); Hahn and Packowski(2015); Hazen et al.(2014); Hazen et al.(2016); Kache and Seuring(2017); Li and Wang(2015); Tan et al.(2015); Wang et al.(2016);

Operation management. Operation management (OM) deals with the design and control of the overall production and operation process to achieve high efficiency in resource planning and effectiveness in business goal accomplishment. With real-time data collected from smart devices, managers have access to unstructured data source, which is helpful in achieving better performance in understanding customers, managing risks, and reducing costs. Current researches have discussed the possibility to incorporate social media, web and sensor data in operation process and production. Chan et al. (2016) find out that social media comments can be analysed to discover useful information for OM, such as product defect discovery (Abrahams et al., 2015), and new product development (Chan et al., 2016).

Besides, Web data such as clickstream can be used to predict offline orders and reduce inventory cost (Huang and Van Mieghem, 2014). Introduced in Guo et al. (2014), cloud-based order tracking and allocation system can reduce production costs and improve efficiency. Moreover, big data promotes innovation in new ideas and methods to collet, store, analyse, adopt, and share it, and it has benefits to be applied for open innovation process (Mount and Martinez, 2014). Overall, efficiency is expected to improve by leveraging big data in business operations. Accordingly, operational research should interact more with big data analytics to take advantage of the comprehensive ecosystem.

Supply chain management. Big data analytics has proven its value in managing the flow of goods and services. Fuchs and Otto (2015) demonstrate the information technology in supply chain planning has significant values and improvement in supply chain can be obtained by financing the IT function. New analytics techniques are developed to support supply chain operations and innovation (Tan et al., 2015). There is potential growth of the in-memory analytics applications in supply chain management due to the real-time data availability and integrated processing models to support operations (Hahn and Packowski, 2015). Besides, sensor data can be used to improve food supply chain management and dynamic pricing (Li and Wang, 2015). In addition, it is worth noticing that data quality is very important in the research and practice in supply chain management, which requires interdisciplinary cooperation to develop control method (Hazen et al., 2014).

Efficiency is the keyword in the operation aspect. It leads to greater utilisation of real time data to reduce costs and risks, as well as stimulate innovation. But to what extent the efficiency can be potentially enhanced with big data incorporated in the existing operation system remains unclear. This is a possible direction where more studies are expected to clarify its magnitude. In addition, the innovative aspect of big data in developing new ideas and new product or services needs further exploration. It is worth noting that data quality is very important in the research and practice in supply chain management, which requires interdisciplinary cooperation to develop control method (Hazen et al., 2014).

4.3 Marketing Perspective of Big Data

In a broad sense, marketing is "the activity, set of institutions, and processes for creating, communicating, delivering, and exchanging offerings that have value for customers, clients, partners, and society at large" (American Marketing Association, 2013, pp. nd)[1] . Efficient communications between firms and customers can promote selling of particular products, service and brand. Through this lens, understanding consumers is the core element in making marketing

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[1] Retrieved from https://www.ama.org/AboutAMA/Pages/Definition-of-Marketing.aspx

decisions. Here we survey literature focusing on interpretation of consumer behaviour and sentiment, and several topics are revealed (see Table 4).

4.3.1 Consumer behaviour

Consumer behaviour reflects the decision making process of customers in selecting, purchasing, utilising the product or service. It is a complicated process and affected by diversified factors. Previous big data researches try to understand consumer behaviour using big data (e.g. mobile, social media data) or considering online social network influence.

User behaviour. Under this topic, there are three aspects to view this issue. The first one links to mobile analytics, which examines the mobile Internet usage behaviour and user engagement. It has been discovered that geographical mobility of users and social network have positive influences on mobile Internet usage behaviour while multimedia content generation have negative influence (Ghose and Han, 2011).

Besides, ranking effects (Ghose et al., 2013) and rewarding (Claussen et al., 2013) promote user engagement and mobile app success, which can increase corresponding mobile website visit (Xu et al., 2014). Second, purchase behaviour is affected by various factors, such as online social media brand community (Goh et al., 2013) and interactive social influences (Zhang et al., 2014). Thus concurrent learning of users' behaviour is beneficial to real-time, intent-based optimal interventions, which increases purchase likelihood (Ding et al., 2015). In addition, learning behaviour is also investigated in prior studies using video stream, blogs and other data to detect the interaction and learning pattern.

Online community. The increasing interaction via the Internet brings out online community, which is a virtual community where members acquire information and communicate with each other through social network platform. Current studies focus on detecting online community as well as identifying characteristic within the community. Several papers propose methods to detect groups in

virtual communities (Chau and Xu, 2007; Wang et al., 2013), discover information (Garg et al., 2011), and identify community (Ludwig et al., 2014). Furthermore, within the online community, leadership and identification emerge, especially the linguistic style match, which shape the community dynamics (Johnson et al., 2015) and drive the network growth (Lu et al., 2013).

Social network effect. Consumer behaviour is also influenced by social network, where the pattern and dynamics, and influencing entities may have great impact. Through analysing social network, adoption probability can be predicted (Fang et al., 2013). Besides, social media can enrich network information, which has positive effect on work productivity and job security (Wu, 2013), brand and retailer performance as well as consumer-retailer loyalty (Rapp et al., 2013). In particular, online user-generated content has positive relation with their social ties and its network effects can boost advertising and revenue growth (Shriver et al., 2013).

4.3.2   Consumer sentiment

Consumer sentiment reflects consumer's feelings, perception, and evaluation of product or service. In e-commerce, online review and rating systems have been designed to detect consumer's opinion and sentiment towards specific commodity (Dellarocas et al., 2007). Besides, sentiment analysis is a hot topic with advancement in analytics techniques and application. One point to note here is that studies on big data from the consumer perspective is not limited to marketing purposes. Looking into consumer opinions can also shed light on operation and production improvement.

Online review. Online review is a form of e-WOM communication and analysing the user-generated contents can potentially predict future sales and assist marketing strategy (Archak et al., 2011; Moon et al., 2014; Lee and Bradlow, 2011). As it has significant impact on consumers' choices, it is important to predict and improve the helpfulness of reviews. Several studies (e.g. Baek et al., 2012; Cao et al., 2011) investigate the influencing factors of review helpfulness and try to predict helpfulness by looking into text linguistic features or reviewer engagement characteristics

(Krishnamoorthy, 2015; Ngo-Ye and Sinha, 2014). Furthermore, online reviews have social influence on other consumers (Sridhar and Srinivasan, 2012), such as their perception of reviews (Cheng and Ho, 2015) and way of writing reviews (Goes et al., 2014; Ludwig et al., 2013). It can also be utilised to measure customer satisfaction with greater effectiveness and efficiency (Kang and Park, 2014). In addition, to enable deeper analysis of product reviews, several advanced text-mining approaches are explored based on language, web or topic structure, which forms part of research in this topic.

Online rating. It normally takes a form of numerical rating where consumers evaluate the products or services by giving scores. The ranking systems analyse user-generated content to assess customer's preference hence provide best-fit product and service (Ghose et al., 2012). Indeed, Moe and Trusov (2011) illustrate that online product ratings dynamics have direct and immediate effects on sales. Sun (2012) further proves a higher variance of product ratings can help with sales increase only if the average rating is low. Besides, online ratings have social influence on other user's rating behaviour (Lee et al., 2015). Moreover, Hu et al. (2012) found that firm manipulation in product rating requires further attention from the business operators.

Sentiment analysis. Sentiment analysis extracts and classifies subjective information in various data sources, which can be applied to improve business intelligence. A synonym, opinion mining, often refers to the same field of study, and we use this term to categories general studies on this topic. Overall, opinion mining provides useful information for decision-making (Alfaro et al., 2013). Especially the marketplace sentiment can advance the way of understanding consumers which is beneficial to niche market identification (Gopaldas, 2014; Jang et al., 2013; He et al., 2015) and brand positioning (Mostafa et al., 2013). Web comment text, social media (e.g. microblog), product reviews and other user-generated contents are commonly used in these studies. In addition, sentiment detection and classification as part of sentiment analysis also attracts research interests. Based on practical purposes, a lot of new methods are explored to detect emotions (e.g. Balahur et

al., 2012; Gao et al., 2015), spot topics (e.g. Li and Wu, 2010), and improve sentiment classification accuracy (e.g. Colace et al., 2015; Khan et la., 2014; Da Silva et al., 2014). They are broadly applied to analyse sentiment and opinions of consumers and market, so as to enhance the overall management efficiency.

4.3.3 Marketing strategy

Big customer data facilitates more specialised market segmentation, which advances marketing strategies such as personalised advertising, brand improvement, and recommendation. Besides, the predictive analytics can examine the real-time marketing performance and influential factors, which enables dynamic adjustment of advertisement strategy (Nichols, 2013).

Advertising and targeting. Advertising is a form of marketing strategy aiming for promoting and selling the product or service, and targeting as a type of advertising segments consumers and communicates with them based on specific behavioural, demographics, psychographics and other features. In recent research, mobile targeting and advertising has been proved to be effective for location-based services (Li and Du, 2012). By incorporating locational and geographical parameters, retailers have more power in offering discriminated prices (Fong et al., 2015) and increase sales (Luo et al., 2014). Andrews et al. (2015) illustrates that physical crowdedness has positive impacts on consumers' response to mobile ads, which is beneficial to hyper-contextual mobile advertisement. Nonetheless, social effects on advertising may vary across markets with different demographic characteristics and groups (Gopinath et al., 2013).

Brand analysis. In general, brand analysis pins down brand position in market, brand perception by consumers, and competitors' brand performance, and so on forth. Regarding big data brand analysis, investigations are most done in a social and consumer context. For example, social media strategic capability can enhance brand innovation (Nguyen et al., 2015) and social tagging has great implications for brand performance measurement and brand equity management (Nam and Kannan,

2014). Besides, online information has an influence on consumers' perception of brands and Camiciottoli et al. (2014) find consistent brand associations in online community of international consumers. Moreover, dynamic analysis of online user-generated content can reflect consumer satisfaction with quality thus improve competitive brand positions (Tirunillai and Tellis, 2014). But, it is worth noticing that analysis of brand sentiment cannot ignore the differences across different social media venue formats (Schweidel and Moe, 2014).

Market analysis. The review indicates that there are several directions in leveraging big data in market analysis. One is market prediction by mining textual and web information from company websites (Nassirtoussi et al., 2014; Nassirtoussi et al., 2015). It has been proven that such information is useful to predict commercial success (Thorleuchter and van den Poel, 2012). A second area is using user-generated contents to enhance marketing efficiency. It can be applied to improve mapping of market structure (Netzer et al., 2012), detect customer-website interaction (Schäfer and Kummer, 2013), and identify future profitable customers more accurately (D'Haen et al., 2013; Thorleuchter et al., 2012). Especially in the era of e-commerce, via capturing detailed customer behaviour information, the knowledge management strategy in marketing can help companies gain competitive advantages in business activities through establishing better interpersonal relations to customers, suppliers, business partners and employees. Digital data plays an increasing important role in B2C and B2B marketing, but there are also challenges facing companies that need to be further addressed (Leeflang et al., 2014).

Recommendation and e-WOM. In Web 2.0 era, recommendation is becoming more customised. User-generated content and their sentiment are analysed to improve accommodating customer needs (Colace et al, 2015; García-Cumbreras et al., 2013; Hyung et al., 2014). Personalised recommendation is achievable with technology improvement and big customer data (Rust and Huang, 2014). According to the findings in Brown et al. (2011), more advanced analysis and customisation are attainable with the use of real-time and wide ranging data streams. Through

routing location (Yang et al., 2008), social network (Chung et al., 2015), community (Feng et al., 2015), and personalised information (Fan et al., 2006), user preference and behaviour can be detected and predicted, which promotes personalisation in marketing entering a higher level. Another powerful tool in recommendation is word-of-mouth, which is an effective form of advertising. In a digital world, online communications and interactions are more frequent. Such electronic word-of-mouth (e-WOM) has expanded impact through Internet on consumer perception and purchase decisions. Many studies have addressed the e-WOM and its impact on sales and consumer behaviour (see Table 4).

From the marketing lens, customer is the priority and understanding their behaviour is the primary concern for marketing researchers. However, information overload may also lead to adverse effects to marketing and firm performance, which has not been well considered in current literature. Besides, the marketing practice should be integrated into higher strategic framework to guide more efficient segmenting and pricing, and this leave research spaces for revenue management and strategic management. In addition, it is understudied in prior studies that what roles the firms play in the digital marketing campaign and their engagement in the online communication activities is an interesting area to be explored in future.

Table 4. Marketing Perspective of Big Data

Marketing perspective			Studies
Consumer behaviour	User behaviour	Customer engagement	Amaro et al.(2016); Claussen et al.(2013); Ding et al.(2015); Ghose and Han(2011); Ghose et al.(2013); Guesalaga(2016); Han et al.(2016); Harrigan et al.(2017); Ibrahim et al.(2017); Oh et al.(2017); Pagani and Malacarne(2017); Risius and Beck(2015); van Doorn et al.(2010); VanMeter et al.(2015); Xu et al.(2014)
		Online learning	He(2013); Mayzlin and Yoganarasimhan(2012); Singh et al.(2014)
	Online community	Online community detection	Chau and Xu(2007); Garg et al.(2011); Ludwig et al.(2014); Wang et al.(2013)
		Online community leadership	Johnson et al.(2015); Lu et al.(2013)
	Social network effect		Fang et al.(2013); Goh et al.(2013); Rapp et al.(2013); Shen et al. (2016); Shriver et al.(2013); Wu(2013); Zhang et al.(2014)
Consumer sentiment	Online review	Marketing and sale prediction	Archak et al.(2011); Chong et al.(2016); Lee and Bradlow(2011); Mauri and Minazzi(2013); Moon et al.(2014); Salehan and Kim(2016); Schneider and Gupta(2016); Sparks and Browning (2011); Xie et al.(2017); Ye et al.(2009); Zhu and Zhang(2010)
		Review helpfulness	Baek et al.(2012); Cao et al.(2011); Chen and Tseng(2011); Krishnamoorthy(2015); Ngo-Ye and Sinha(2014); Singh et al.(2017)
		Social influence	Cheng and Ho(2015); Goes et al.(2014); Ludwig et al.(2013); Sridhar and Srinivasan(2012)
		Customer satisfaction	Chen et al.(2016); Hildebrand et al.(2013); Kang and Park(2014); Xiang et al.(2015)
		Text mining	Ordenes et al. (2014); Wang et al.(2013); Zhan et al.(2009)
	Rating and ranking		Büschken and Allenby(2016); Chung and Tseng(2012); Gao et al.(2015); Ghose et al.(2012); Lee et al.(2015); Moe and Trusov(2011); Sun(2012)
	Sentiment analysis	Opinion mining	Alfaro et al.(2013); García-Moya et al.(2013); Gopaldas(2014); He et al.(2015); Homburg et al.(2015); Jang et al.(2013); Kontopoulos et al.(2013); Li and Wu(2010); Marrese-Taylor et al.(2014)
		Sentiment detection	Balahur et al.(2012); Colace et al.(2015); Costa et al.(2012); Das and Chen(2007); Dehkharghani et al.(2014); Gao et al.(2015); Mostafa et al.(2013); Yang and Lee(2008)
		Sentiment classification	Da Silva et al.(2014); Deng et al.(2014); Fang et al.(2014); Fersini et al.(2014); Khan et al.(2014); Ye et al.(2009)

Marketing strategy	Advertising and targeting	Mobile advertising and targeting	Andrews et al.(2015); Fong et al.(2015); Ghose and Han(2014); Grewal et al.(2016); Li and Du(2012); Luo et al.(2014); Shankar et al.(2016)
		Digital and social media advertising	Ghose and Todri-Adamopoulos(2016); Gopinath et al.(2013); Iyer and Katona(2015); Järvinen and Karjaluoto(2015); Kumar et al.(2017); Li et al. (2014); Liu and Mattila(2017); Malthouse et al.(2013); Mariani et al.(2016); Trusov et al.(2016)
	Brand analysis		Camiciottoli et al.(2014); Culotta and Cutler(2016); Godey et al.(2016); Gretry et al.(2017); Hamilton et al.(2016); Költringer and Dickinger(2015); Moro et al.(2016); Nam and Kannan(2014); Nguyen et al.(2015); Pournarakis et al.(2017); Schweidel and Moe(2014); Tirunillai and Tellis(2014);
	Electronic word-of-mouth		Balaji et al.(2016); Cantallops and Salvi(2014); Cascio et al.(2015); Chen and Xie (2005); Eisingerich et al.(2015); Hennig-Thurau et al.(2015); Kim et al.(2015); King et al.(2014); Kumar et al.(2016); Lee and Song(2010); Mayzlin (2006); Godes and Mayzlin(2009); Sonnier et al.(2011); Tang and Guo(2015); Xiang et al.(2017)
	Market analysis	Market prediction	Beukeboom et al.(2015); D'Haen et al.(2013); France and Ghose(2016); Liu et al.(2016); Nassirtoussi et al.(2014); Nassirtoussi et al.(2015); Netzer et al.(2012); Thorleuchter et al.(2012);
		E-commerce	Leeflang et al.(2014); Oestreicher-Singer and Sundararajan(2012); Schäfer and Kummer(2013); Thorleuchter and Van den Poel(2012)
	Recommendation	Recommendation	Colace et al.(2015); García-Cumbreras et al.(2013); Hyung et al.(2014); Zhang and Jiao(2007)
		Personalisation	Chung et al.(2015); Fan et al. (2006); Feng et al.(2015); Ho et al.(2011); Lee(2007); Rust and Huang(2014); Yang et al.(2008); Yeh et al.(2009)

4.4 Information Management Perspective of Big Data

From the information management perspective, big data research primarily concerns data acquisition and process effectiveness. The availability and feasibility of information is critical to organisational success in term of strategic decision-making. It closely relates to data and technology issues, and there are diversified papers on big data management and analytics problems, especially in technology and engineering fields. Nevertheless, this paper limits the view to management-related or business-related articles. These papers propose or adopt improved or novel approaches to deal with big data for various management purposes. In general, information management professionals and researchers are particularly interested in acquiring information and knowledge from various data sources (see Table 5).

Table 5. Information Management Perspective of Big Data

Information management perspective	Studies
Information retrieval	Beebe et al.(2011) ; Dai et al.(2015); Liao et al.(2014); Wei et al.(2007)
Knowledge discovery	Chung et al. (2005); Lee and Wang(2012); Lee et al.(2011); Li et al.(2016); Zhou et al.(2016)
Text mining	Duan et al.(2011) ; Hashimi et al.(2015); Lo(2008); Singh et al.(2011); Yang(2009)
Web mining	Chau and Chen(2008); Prates et al.(2013); Wang et al.(2007)
Idea mining	Thorleuchter and Van den Poel(2013); Thorleuchter et al.(2010)
Topic detection	Bao and Datta(2014); Özyurt and Köse(2010); Yoon(2012); Zeng et al.(2010)
Document clustering	Kou and Lou(2012); Wei et al. (2006); Wei et al.(2008); Wei et al.(2008)
Document classification	Colace et al.(2014); Ur-Rahman and Harding(2012)
Cloud computing	Demirkan and Delen(2013); Marston et al.(2011)

Information retrieval frameworks are advanced with better search effectiveness (Liao et al, 2014; Beebe et al., 2011; Wei et al., 2007), so as knowledge discovery in web searching and geographic information retrieval (Lee and Wang, 2012; Lee et al., 2011). Textual and web data attract most interests in current research and many studies address text mining (e.g. Duan et al., 2011; Hashimi et al., 2015) and web mining (Chau and Chen, 2008; Wang et al., 2007) problems for the purpose of

improving information search and extraction efficiency. Moreover, clustering and classification of data is critical to data management and subsequent data analysis. Novel and improved approaches have been put forward in an attempt to achieve better effectiveness and accuracy (e.g. Wei et al., 2008; Ur-Rahman and Harding, 2012). These advanced methods facilitate topic detection for business planning and risk control (e.g. Zeng et al., 2010; Yoon, 2012; Bao and Datta, 2014), as well as idea mining for innovation (e.g. Thorleuchter and Van den Poel., 2013; Thorleuchter et al., 2010). Overall, big data research in information management explores new ways to deal with massive data and these methods can be applied to studies in different areas, which provide solid technical or technological support for research in other management fields.

4.5 Other Perspectives of Big Data

Apart from the above main streams in current big data literature, some researchers look into big data in management and business from several other different perspectives (see Table 6).

Table 6. Other Management Perspectives of Big Data

Other perspectives		Studies
Accounting and Finance	Financial performance	Balakrishnan et al.(2010); Schniederjans et al.(2013); Seddon and Currie(2017); Yu et al.(2013)
	Accounting and auditing	Brown-Liburd et al.(2015); Cao et al.(2015); Glancy and Yadav(2011); Vasarhelyi et al.(2015)
International business		Lau et al.(2012); Okazaki and Taylor(2013)
Public administration		Grimmelikhuijsen and Meijer(2015); Guillamón et al.(2016); Huberty(2015); Jun and Chung(2016); Lavertu (2015); Lev-On and Steinfeld(2015); Panagiotopoulos et al.(2016); Suh et al.(2010); Wang and Hajli(2017); Welch et al.(2016); Wu et al.(2016); Zissis and Lekkas(2011)
Others		Chang et al.(2014); Coussement and Van den Poel(2008); Fuller et al.(2011); Noh et al.(2015)

Accounting and Finance. In accounting and finance area, big data is regarded as an informative source that can affect and predict firm financial performance (Balakrishnan et al., 2010). Especially social media has great effects on stock performance (Schniederjans et al., 2013; Yu et al., 2013).

Besides, by incorporating big data, accounting nature and audit judgement are also changing (Vasarhelyi et al., 2015; Brown-Liburd et al., 2015). Textual data is effectively used to detect financial fraud in reports (Glancy and Yadav, 2011) and Cao et al. (2015) discuss the potential adoption of big data analytics to improve financial statement audits efficiency. Although the opportunities and the potential benefits of big data are significant for accounting and finance domain, the challenges is to incorporate non-traditional sources of data into conventional data sources to support accounting and finance practices.

International business. The international business perspective refers to the big data driven studies on performance of trade and investment activities by firms across national borders (see Cavusgil et al., 2012). Articles are rarely seen in this area in present research. In the Web 2.0 environment, big data is expected to play a role in global business. As illustrated in Lau et al. (2012), online environment scanning using Web 2.0 helps improve decision making on cross-border merger and acquisition. Okazaki and Taylor (2013) focus on use of social media for international advertising and identify several theoretical foundations for future search. There remains research space around this topic to explore the potential use of big data in international business decisions and operations.

Public administration. In public service, big data has several application areas. One recent study has focused on how big data could be utilised in combating health emergences such as Ebola (Amankwah-Amoah, 2016). Moreover, e-voting and e-government can benefit from big data, such as cloud computing (Zissis and Lekkas, 2011). Likewise, Suh et al. (2010) discovered that text could be combined with data mining to efficiently detect and forecast trend of petition in e-government. Because of greater transparency and participation, use of social media can enhance perceived police legitimacy (Grimmelikhuijsen and Meijer, 2015) and big data may assist improving the management of public programs (Lavertu, 2015).

5. DISCUSSIONS AND CONCLUSIONS

The paper sought to review the literature on big data across the social science disciplines. The study provided an overview of the big data research in management domain and presented insights from 285 articles. By classifying and analysing the identified literature, we clarify several perspectives of management communities and offer a clearer picture of the status of big data research. Based on the comprehensive review, a conceptual map of big data research is provided with central themes along the different management subjects (see Table 7). In all these subjective areas, some challenging and promising avenues are suggested for future research. To the best of our knowledge, this is the first comprehensive review on big data literature across the social science disciplines. Our review provide a valuable systematisation and consolidation of extant big data research and can help strengthen management and business research in this field.

The foregoing analysis indicates that prior studies have identified big data's significance in business and management improvement. There is growing body of research across the disciplines to demonstrate that the great potential of data-driven approach does not only sparkle at technical stage to extract and process information, but also the technological innovation promotes changes in managing organisation, operation, marketing and other business activities. By leveraging big data into management mechanism, additional values can be discovered, created and realised in business development.

The review also indicates that despite the fact that management professionals and researchers have growing attention on big data, the full benefits have not been accrued yet as a result of advancing technology and changing business environment. We propose a unified and dynamic framework (see Figure 4), where all management activities are connected, and progress in each management area can contribute to the big data value achievement. To discover the full value, firms need to formulate and implement a data-driven strategy. Top management teams should also make strategic adjustment within organisations through measure such as investment in IT innovation and data

analytics skills development. Supported by advanced techniques to analyse and interpret big data, executives would be able to make decisions in a strategic, timely, and flexible manner. The overall performance of operation, marketing, and other business activities principally depend on the quality of strategic decision-making, which also determines the realisation of profits and gaining competitive advantages.
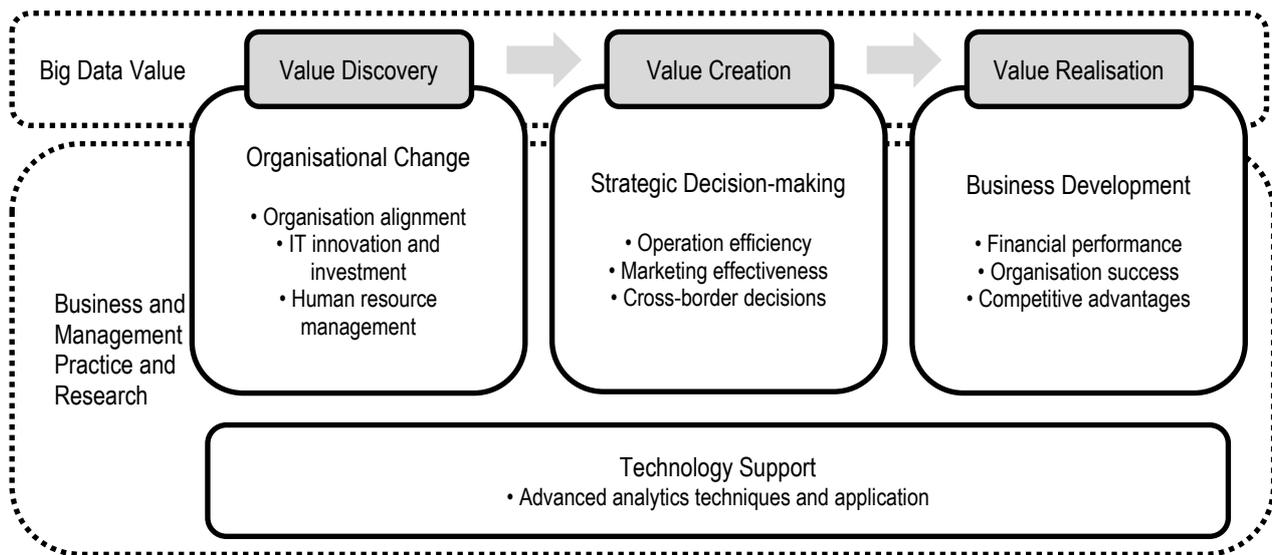

Figure 4. Big Data Value Achievement and Management Practice

The organising framework reveals great needs and space for big data research in management domain. First, theoretical development is in a need to provide general guidance for researchers to implement big data methods. Besides, it is also worth noting that "technology transfer" is critical for researchers to identify the best use of analytics techniques to achieve optimal performance. It is not clear in current research what techniques are available and optimal for data analytics in management, which needs to be clarified and comparatively evaluated. Another possible question relates to organisational investment on IT innovation, and its impact and return should be assessed to offer practical insights for executives. In addition, current research interests among different topics are not evenly distributed, and some fruitful areas remain unstudied or insufficient. We list a few promising areas for future research in various communities which may potentially benefit big data research development (see Table 7).

Table 7. Comparison of Perspectives of the Academic Communities in Big Data Research

Perspective	Key interest	Big data impact	Research context	Avenue for future research
Organisation	• Organisational change and strategic decision-making	• Data-driven decision • Ecosystem change • Management process • Innovation	• Organisation structure • Organisation functions • Big data commitment • Business intelligence • Strategic action	• Organisation alignment with data-driven strategy (e.g. culture, operation, function, etc.) • HRM improvement (e.g. talent management, leadership, skill training etc.) • Reshape of strategic operational mechanism and actions • New perceptions on value of experience, nature of expertise, practice of management
Operation	• Operation efficiency	• Real-time control • Reduced cost and risk	• Production, innovation and supply chain • Sensor/Web/Social media	• Innovation e.g. new product and operation process • Further improvement of operation efficiency • Big data supply chain evaluation
Marketing	• Consumer and marketing effectiveness	• Online evaluation • Personalisation • Better understanding of consumers and market	• Social media/Sensor • Advertising • Social influence • Consumer behaviour and sentiment	• Possible adverse effect of online social network marketing • Segmented pricing and revenue management • Firm engagement with online communication • New strategy evaluation
Information management	• Advanced analytics technique application	• Challenges in data management and analysis • Advanced algorithms	• Data acquisition and process • Modelling	• Models and techniques evaluation and comparison • Data quality improvement
Others	• Accounting and finance, Public sector, International business	• Firm performance • Greater transparency and participation • Better understanding of foreign market	• Social media • Management actions • Cross-border decision and operation	• Accounting quality • Challenges and risks of big data use in public sector • International decision and business operation (marketing, supply chain, merger and acquisition, investment etc.)

REFERENCES

Abrahams, A., Fan, W., Wang, G., Zhang, Z. and Jiao, J. (2014). An integrated text analytic framework for product defect discovery. *Production and Operations Management*, 24(6), pp.975-990.

Academic Journal Guide 2015 (2015). The Association of Business Schools.

Akter, S., Wamba, S. F., Gunasekaran, A., Dubey, R., and Childe, S. J. (2016). How to improve firm performance using big data analytics capability and business strategy alignment?. *International Journal of Production Economics*, 182, pp.113-131.

Alfaro, C., Cano-Montero, J., Gómez, J., Moguerza, J. and Ortega, F. (2013). A multi-stage method for content classification and opinion mining on weblog comments. *Annals of Operations Research*, 236(1), pp.197-213.

Aloysius, J. A., Hoehle, H., and Venkatesh, V. (2016). Exploiting big data for customer and retailer benefits: A study of emerging mobile checkout scenarios. *International Journal of Operations & Production Management,* 36(4), pp.467-486.

Amankwah-Amoah, J. (2015). Safety or no safety in numbers? Governments, big data and public policy formulation. *Industrial Management and Data System*, 115, pp.1596–1603.

Amankwah-Amoah, J. (2016). Emerging economies, emerging challenges: Mobilising and capturing value from big data. *Technological Forecasting and Social Change*, 110, pp.167-174.

Amaro, S., Duarte, P., and Henriques, C. (2016). Travelers' use of social media: A clustering approach. *Annals of Tourism Research*, 59, pp.1-15.

Andrews, M., Luo, X., Fang, Z. and Ghose, A. (2016). Mobile ad effectiveness: Hyper-contextual targeting with crowdedness. *Marketing Science*, 35(2), pp.218-233.

Archak, N., Ghose, A. and Ipeirotis, P. (2011). Deriving the pricing power of product features by mining consumer reviews. *Management Science*, 57(8), pp.1485-1509.

Baek, H., Ahn, J. and Choi, Y. (2012). Helpfulness of online consumer reviews: readers' objectives and review cues. *International Journal of Electronic Commerce*, 17(2), pp.99-126.

Balahur, A., Hermida, J. and Montoyo, A. (2012). Detecting implicit expressions of emotion in text: A comparative analysis. *Decision Support Systems*, 53(4), pp.742-753.

Balaji, M. S., Khong, K. W., and Chong, A. Y. L. (2016). Determinants of negative word-of-mouth communication using social networking sites. *Information & Management*, 53(4), pp.528-540.

Balakrishnan, R., Qiu, X. and Srinivasan, P. (2010). On the predictive ability of narrative disclosures in annual reports. *European Journal of Operational Research*, 202(3), pp.789-801.

Bao, Y. and Datta, A. (2014). Simultaneously discovering and quantifying risk types from textual risk disclosures. *Management Science*, 60(6), pp.1371-1391.

Beath, C., Becerra-Fernandez, I., Ross, J. and Short, J. (2012). Finding value in the information explosion. *MIT Sloan Management Review*, 53(4), pp.18-20.

Beebe, N., Clark, J., Dietrich, G., Ko, M. and Ko, D. (2011). Post-retrieval search hit clustering to improve information retrieval effectiveness: Two digital forensics case studies. *Decision Support Systems*, 51(4), pp.732-744.

Beukeboom, C., Kerkhof, P. and de Vries, M. (2015). Does a virtual like cause actual liking? How following a brand's Facebook updates enhances brand evaluations and purchase intention. *Journal of Interactive Marketing*, 32, pp.26-36.

Bharadwaj, A., El Sawy, O.A., Pavlou, P.A. and Venkatraman, N. (2013). Digital business strategy: toward a next generation of insights. *MIS Quarterly*, 37(2), pp.471-482.

Bhimani, A. (2015). Exploring big data's strategic consequences. *Journal of Information Technology*, 30(1), pp.66-69.

Bollier, D. and Firestone, C.M. (2010). *The promise and peril of big data*. Washington, DC: Aspen Institute, Communications and Society Program.

Braganza, A., Brooks, L., Nepelski, D., Ali, M., and Moro, R. (2017). Resource management in big data initiatives: Processes and dynamic capabilities. *Journal of Business Research*, 70, pp.328-337.

Brown, B., Chui, M. and Manyika, J., 2011. Are you ready for the era of 'big data'. *McKinsey Quarterly*, 4(2011), pp.24-35.

Brown-Liburd, H., Issa, H. and Lombardi, D. (2015). Behavioral implications of big data's impact on audit judgment and decision making and future research directions. *Accounting Horizons*, 29(2), pp.451-468.

Büschken, J., and Allenby, G. M. (2016). Sentence-based text analysis for customer reviews. *Marketing Science*, 35(6), pp.953-975.

Camiciottoli, B.C., Ranfagni, S. and Guercini, S. (2014). Exploring brand associations: an innovative methodological approach. *European Journal of Marketing*, 48(5/6), pp.1092-1112.

Cantallops, A.S. and Salvi, F. (2014). New consumer behavior: A review of research on eWOM and hotels. *International Journal of Hospitality Management*, 36, pp.41-51.

Cao, M., Chychyla, R. and Stewart, T. (2015). Big data analytics in financial statement audits. *Accounting Horizons*, 29(2), pp.423-429.

Cao, Q., Duan, W. and Gan, Q. (2011). Exploring determinants of voting for the "helpfulness" of online user reviews: A text mining approach. *Decision Support Systems*, 50(2), pp.511-521.

Cascio, C., O'Donnell, M., Bayer, J., Tinney, F. and Falk, E. (2015). Neural correlates of susceptibility to group opinions in online word-of-mouth recommendations. *Journal of Marketing Research*, 52(4), pp.559-575.

Castellanos, M., Gupta, C., Wang, S., Dayal, U. and Durazo, M. (2012). A platform for situational awareness in operational BI. *Decision Support Systems*, 52(4), pp.869-883.

Cavusgil, S. T., Knight, G. A., and Riesenberger, J. R. (2012). *International business: Strategy, management, and the new realitie*s. 2nd ed. Upper Saddle River: Pearson Prentice Hall.

Chae, B. K. (2015). Insights from hashtag# supplychain and Twitter analytics: Considering Twitter and Twitter data for supply chain practice and research. *International Journal of Production Economics*, 165, pp.247-259.

Chan, H., Lacka, E., Yee, R. and Lim, M. (2015). The role of social media data in operations and production management. *International Journal of Production Research*, pp.1-10.

Chan, H., Wang, X., Lacka, E. and Zhang, M. (2016). A mixed-method approach to extracting the value of social media data. *Production and Operations Management*, 25(3), pp.568-583.

Chang, R., Kauffman, R. and Kwon, Y. (2014). Understanding the paradigm shift to computational social science in the presence of big data. *Decision Support Systems*, 63, pp.67-80.

Chau, M. and Chen, H. (2008). A machine learning approach to web page filtering using content and structure analysis. *Decision Support Systems*, 44(2), pp.482-494.

Chau, M. and Xu, J. (2007). Mining communities and their relationships in blogs: A study of online hate groups. *International Journal of Human-Computer Studies*, 65(1), pp.57-70.

Chen, C. and Tseng, Y. (2011). Quality evaluation of product reviews using an information quality framework. *Decision Support Systems*, 50(4), pp.755-768.

Chen, D. Q., Preston, D. S., and Swink, M. (2015). How the use of big data analytics affects value creation in supply chain management. *Journal of Management Information Systems*, 32(4), pp.4-39.

Chen, H., Chiang, R.H. and Storey, V.C. (2012). Business intelligence and analytics: From big data to big impact. *MIS Quarterly*, 36(4), pp.1165-1188.

Chen, H., Zheng, Z. E., and Ceran, Y. (2015). De-biasing the reporting bias in social media analytics. *Production and Operations Management*, 25(5), pp.849-865.

Chen, Y. and Xie, J. (2005). Third-party product review and firm marketing strategy. *Marketing Science*, 24(2), pp.218-240.

Cheng, Y. and Ho, H. (2015). Social influence's impact on reader perceptions of online reviews. *Journal of Business Research*, 68(4), pp.883-887.

Chong, A. Y. L., Li, B., Ngai, E. W., Ch'ng, E., and Lee, F. (2016). Predicting online product sales via online reviews, sentiments, and promotion strategies: A big data architecture and neural network approach. *International Journal of Operations & Production Management*, 36(4), pp.358-383.

Chung, T., Wedel, M. and Rust, R. (2015). Adaptive personalization using social networks. *Journal of the Academy of Marketing Science*, 44(1), pp.66-87.

Chung, W. and Tseng, T. (2012). Discovering business intelligence from online product reviews: A rule-induction framework. *Expert Systems with Applications*, 39(15), pp.11870-11879.

Chung, W., Chen, H. and Nunamaker Jr, J.F. (2005). A visual framework for knowledge discovery on the Web: An empirical study of business intelligence exploration. *Journal of Management Information Systems*, 21(4), pp.57-84.

Claussen, J., Kretschmer, T. and Mayrhofer, P. (2013). The effects of rewarding user engagement: The case of Facebook apps. *Information Systems Research*, 24(1), pp.186-200.

Colace, F., Casaburi, L., De Santo, M. and Greco, L. (2015). Sentiment detection in social networks and in collaborative learning environments. *Computers in Human Behavior*, 51, pp.1061-1067.

Colace, F., De Santo, M., Greco, L. and Napoletano, P. (2014). Text classification using a few labeled examples. *Computers in Human Behavior*, 30, pp.689-697.

Colace, F., De Santo, M., Greco, L., Moscato, V. and Picariello, A. (2015). A collaborative user-centered framework for recommending items in online social networks. *Computers in Human Behavior*, 51, pp.694-704.

Côrte-Real, N., Oliveira, T., and Ruivo, P. (2017). Assessing business value of big data analytics in European firms. *Journal of Business Research*, 70, pp.379-390.

Costa, E., Ferreira, R., Brito, P., Bittencourt, I., Holanda, O., Machado, A. and Marinho, T. (2012). A framework for building web mining applications in the world of blogs: A case study in product sentiment analysis. *Expert Systems with Applications*, 39(5), pp.4813-4834.

Coussement, K. and Van den Poel, D. (2008). Integrating the voice of customers through call center emails into a decision support system for churn prediction. *Information & Management*, 45(3), pp.164-174.

Culotta, A., and Cutler, J. (2016). Mining brand perceptions from twitter social networks. *Marketing Science*, 35(3), pp.343-362.

D'Haen, J., Van den Poel, D. and Thorleuchter, D. (2013). Predicting customer profitability during acquisition: Finding the optimal combination of data source and data mining technique. *Expert Systems with Applications*, 40(6), pp.2007-2012.

da Silva, N., Hruschka, E. and Hruschka, E. (2014). Tweet sentiment analysis with classifier ensembles. *Decision Support Systems*, 66, pp.170-179.

Dai, W., Han, D., Dai, Y., and Xu, D. (2015). Emotion recognition and affective computing on vocal social media. *Information & Management*, 52(7), pp.777-788.

Das, S.R. and Chen, M.Y. (2007). Yahoo! for Amazon: Sentiment extraction from small talk on the web. *Management Science*, 53(9), pp.1375-1388.

Davenport, T.H. (2014). *Big data at work: Dispelling the myths, uncovering the opportunities.* Boston, MA: HBS Press.

Dehkharghani, R., Mercan, H., Javeed, A. and Saygin, Y. (2014). Sentimental causal rule discovery from Twitter. *Expert Systems with Applications*, 41(10), pp.4950-4958.

Dellarocas, C. (2006). Strategic manipulation of Internet opinion forums: Implications for consumers and firms. *Management Science*, 52(10), pp.1577-1593.

Dellarocas, C., Zhang, X. and Awad, N. (2007). Exploring the value of online product reviews in forecasting sales: The case of motion pictures. *Journal of Interactive Marketing*, 21(4), pp.23-45.

Demirkan, H. and Delen, D. (2013). Leveraging the capabilities of service-oriented decision support systems: Putting analytics and big data in cloud. *Decision Support Systems*, 55(1), pp.412-421.

Deng, Z., Luo, K. and Yu, H. (2014). A study of supervised term weighting scheme for sentiment analysis. *Expert Systems with Applications*, 41(7), pp.3506-3513.

Dijkmans, C., Kerkhof, P. and Beukeboom, C. (2015). A stage to engage: Social media use and corporate reputation. *Tourism Management*, 47, pp.58-67.

Ding, A.W., Li, S. and Chatterjee, P. (2015). Learning user real-time intent for optimal dynamic web page transformation. *Information Systems Research*, 26(2), pp.339-359.

Duan, J.Y., Zhang, M., Wang, J.Z., and Xu, Y.S. (2011). A hybrid framework to extract bilingual multiword expression from free text. *Expert Systems with Applications*, 38(1), pp.314-320.

Dutta, D. and Bose, I. (2015). Managing a big data project: The case of Ramco Cements Limited. *International Journal of Production Economics*, 165, pp.293-306.

Eisingerich, A., Chun, H., Liu, Y., Jia, H. and Bell, S. (2015). Why recommend a brand face-to-face but not on Facebook? How word-of-mouth on online social sites differs from traditional word-of-mouth. *Journal of Consumer Psychology*, 25(1), pp.120-128.

Erevelles, S., Fukawa, N., and Swayne, L. (2016). Big Data consumer analytics and the transformation of marketing. *Journal of Business Research*, 69(2), pp.897-904.

Fan, W., Gordon, M. and Pathak, P. (2006). An integrated two-stage model for intelligent information routing. *Decision Support Systems*, 42(1), pp.362-374.

Fang, F., Dutta, K. and Datta, A. (2014). Domain adaptation for sentiment classification in light of multiple sources. *INFORMS Journal on Computing*, 26(3), pp.586-598.

Fang, X., Hu, P., Li, Z. and Tsai, W. (2013). Predicting adoption probabilities in social networks. *Information Systems Research*, 24(1), pp.128-145.

Feng, H., Tian, J., Wang, H. and Li, M. (2015). Personalized recommendations based on time-weighted overlapping community detection. *Information & Management*, 52(7), pp.789-800.

Fersini, E., Messina, E. and Pozzi, F. (2014). Sentiment analysis: Bayesian ensemble learning. *Decision Support Systems*, 68, pp.26-38.

Fong, N., Fang, Z. and Luo, X. (2015). Geo-conquesting: Competitive locational targeting of mobile promotions. *Journal of Marketing Research*, 52(5), pp.726-735.

France, S. L., and Ghose, S. (2016). An analysis and visualization methodology for identifying and testing market structure. *Marketing Science*, 35(1), pp.182-197.

Fuchs, C. and Otto, A., 2015. Value of IT in supply chain planning. *Journal of Enterprise Information Management*, 28(1), pp.77-92.

Fuller, C., Biros, D. and Delen, D. (2011). An investigation of data and text mining methods for real world deception detection. *Expert Systems with Applications*, 38(7), pp.8392-8398.

Gandomi, A. and Haider, M. (2015). Beyond the hype: Big data concepts, methods, and analytics. *International Journal of Information Management*, 35(2), pp.137-144.

Gao, G.G., Greenwood, B.N., Agarwal, R. and Jeffrey, S. (2015). Vocal minority and silent majority: How do online ratings reflect population perceptions of quality?. *MIS Quarterly*, 39(3), pp.565-589.

Gao, K., Xu, H. and Wang, J. (2015). A rule-based approach to emotion cause detection for Chinese micro-blogs. *Expert Systems with Applications*, 42(9), pp.4517-4528.

García-Cumbreras, M., Montejo-Ráez, A. and Díaz-Galiano, M. (2013). Pessimists and optimists: Improving collaborative filtering through sentiment analysis. *Expert Systems with Applications*, 40(17), pp.6758-6765.

García-Moya, L., Kudama, S., Aramburu, M. and Berlanga, R. (2013). Storing and analysing voice of the market data in the corporate data warehouse. *Information Systems Frontiers*, 15(3), pp.331-349.

Garg, R., Smith, M.D. and Telang, R. (2011). Measuring information diffusion in an online community. *Journal of Management Information Systems*, 28(2), pp.11-38.

Gerhardt, B., & Griffin, K., & Klemann, R. (2012). *Unlocking value in the fragmented world of big data analytics: how information infomediaries will create a new data ecosystem*. Cisco Internet Business Solutions Group (IBSG).

Ghose, A. and Han, S. (2014). Estimating demand for mobile applications in the new economy. *Management Science*, 60(6), pp.1470-1488.

Ghose, A. and Han, S.P. (2011). An empirical analysis of user content generation and usage behavior on the mobile Internet. *Management Science*, 57(9), pp.1671-1691.

Ghose, A., and Todri, V. (2015). Towards a digital attribution model: Measuring the impact of display advertising on online consumer behavior. *MIS Quarterly*, 40(4), pp.889-910.

Ghose, A., Goldfarb, A. and Han, S. (2013). How is the mobile Internet different? Search costs and local activities. *Information Systems Research*, 24(3), pp.613-631.

Ghose, A., Ipeirotis, P. and Li, B. (2012). Designing ranking systems for hotels on travel search engines by mining user-generated and crowdsourced content. *Marketing Science*, 31(3), pp.493-520.

Glancy, F. and Yadav, S. (2011). A computational model for financial reporting fraud detection. *Decision Support Systems*, 50(3), pp.595-601.

Godes, D. and Mayzlin, D. (2009). Firm-created word-of-mouth communication: Evidence from a field test. *Marketing Science*, 28(4), pp.721-739.

Godey, B., Manthiou, A., Pederzoli, D., Rokka, J., Aiello, G., Donvito, R., and Singh, R. (2016). Social media marketing efforts of luxury brands: Influence on brand equity and consumer behavior. *Journal of Business Research*, 69(12), pp.5833-5841.

Goes, P., Lin, M. and Au Yeung, C. (2014). "Popularity effect" in user-generated content: Evidence from online product reviews. *Information Systems Research*, 25(2), pp.222-238.

Goh, K., Heng, C. and Lin, Z. (2013). Social media brand community and consumer behavior: Quantifying the relative impact of user- and marketer-generated content. *Information Systems Research*, 24(1), pp.88-107.

Gopaldas, A. (2014). Marketplace Sentiments. *Journal of Consumer Research*, 41(4), pp.995-1014.

Gopinath, S., Chintagunta, P. and Venkataraman, S. (2013). Blogs, advertising, and local-market movie box office performance. *Management Science*, 59(12), pp.2635-2654.

Gretry, A., Horváth, C., Belei, N., and van Riel, A. C. (2017). "Don't pretend to be my friend!" When an informal brand communication style backfires on social media. *Journal of Business Research*, 74, pp.77-89.

Grewal, D., Bart, Y., Spann, M., and Zubcsek, P. P. (2016). Mobile advertising: A framework and research agenda. *Journal of Interactive Marketing*, 34, pp.3-14.

Grimmelikhuijsen, S. and Meijer, A. (2015). Does Twitter increase perceived police legitimacy? *Public Administration Review*, 75(4), pp.598-607.

Groves, W., Collins, J., Gini, M. and Ketter, W. (2014). Agent-assisted supply chain management: Analysis and lessons learned. *Decision Support Systems*, 57, pp.274-284.

Gu, B. and Ye, Q. (2013). First Step in Social Media: Measuring the Influence of Online Management Responses on Customer Satisfaction. *Production and Operations Management*, 23(4), pp.570-582.

Guesalaga, R. (2016). The use of social media in sales: Individual and organizational antecedents, and the role of customer engagement in social media. *Industrial Marketing Management*, 54, pp.71-79.

Guillamón, M. D., Ríos, A. M., Gesuele, B., and Metallo, C. (2016). Factors influencing social media use in local governments: The case of Italy and Spain. *Government Information Quarterly*, 33(3), pp.460-471.

Gunasekaran, A., Papadopoulos, T., Dubey, R., Wamba, S.F., Childe, S.J., Hazen, B. and Akter, S. (2017). Big data and predictive analytics for supply chain and organisational performance. *Journal of Business Research*, 70, pp.308-317.

Guo, Z., Wong, W. and Guo, C. (2014). A cloud-based intelligent decision-making system for order tracking and allocation in apparel manufacturing. *International Journal of Production Research*, 52(4), pp.1100-1115.

Gupta, M., and George, J. F. (2016). Toward the development of a big data analytics capability. *Information & Management*, 53(8), pp.1049-1064.

Hahn, G. and Packowski, J. (2015). A perspective on applications of in-memory analytics in supply chain management. *Decision Support Systems*, 76, pp.45-52.

Halevi, G. and Moed, H., 2012. The evolution of big data as a research and scientific topic: Overview of the literature. *Research Trends*, 30(1), pp.3-6.

Hamilton, M., Kaltcheva, V. D., and Rohm, A. J. (2016). Social media and value creation: The role of interaction satisfaction and interaction immersion. *Journal of Interactive Marketing*, 36, 121-133.

Han, S. P., Park, S., and Oh, W. (2015). Mobile app analytics: A multiple discrete-continuous choice framework. *MIS Quarterly*, 40(4), pp.983-1008.

Harrigan, P., Evers, U., Miles, M., and Daly, T. (2017). Customer engagement with tourism social media brands. *Tourism Management*, 59, pp.597-609.

Hashimi, H., Hafez, A. and Mathkour, H. (2015). Selection criteria for text mining approaches. *Computers in Human Behavior*, 51, pp.729-733.

Hazen, B., Boone, C., Ezell, J. and Jones-Farmer, L. (2014). Data quality for data science, predictive analytics, and big data in supply chain management: An introduction to the problem and suggestions for research and applications. *International Journal of Production Economics*, 154, pp.72-80.

Hazen, B.T., Skipper, J.B., Boone, C.A. and Hill, R.R. (2016). Back in business: operations research in support of big data analytics for operations and supply chain management. *Annals of Operations Research*, pp.1-11.

He, W. (2013). Examining students' online interaction in a live video streaming environment using data mining and text mining. *Computers in Human Behavior*, 29(1), pp.90-102.

He, W., Wu, H., Yan, G., Akula, V. and Shen, J. (2015). A novel social media competitive analytics framework with sentiment benchmarks. *Information & Management*, 52(7), pp.801-812.

Hennig-Thurau, T., Wiertz, C. and Feldhaus, F. (2014). Does Twitter matter? The impact of microblogging word of mouth on consumers' adoption of new movies. *Journal of the Academy of Marketing Science,* 43(3), pp.375-394.

Hildebrand, C., Häubl, G., Herrmann, A. and Landwehr, J. (2013). When social media can be bad for you: Community feedback stifles consumer creativity and reduces satisfaction with self-designed products. *Information Systems Research*, 24(1), pp.14-29.

Hitt, M. A., Ireland, R. D., & Hoskisson, R. E. (2011). *Strategic management: Competitiveness and globalization*, 9th ed. Mason, OH: Thomson South-Western.

Hitt, M.A., Ireland, R.D., and Hoskisson, R.E. (2015). *Strategic management: Competitiveness and globalization*, 11th ed. Cengage Learning.

Ho, S., Bodoff, D. and Tam, K. (2011). Timing of adaptive web personalization and its effects on online consumer behavior. *Information Systems Research*, 22(3), pp.660-679.

Homburg, C., Ehm, L. and Artz, M. (2015). Measuring and managing consumer sentiment in an online community environment. *Journal of Marketing Research*, 52(5), pp.629-641.

Hu, N., Bose, I., Koh, N. and Liu, L. (2012). Manipulation of online reviews: An analysis of ratings, readability, and sentiments. *Decision Support Systems*, 52(3), pp.674-684.

Huang, T. and Van Mieghem, J. (2013). Clickstream data and inventory management: Model and empirical analysis. *Production and Operations Management*, 23(3), pp.333-347.

Huberty, M. (2015). Can we vote with our tweet? On the perennial difficulty of election forecasting with social media. *International Journal of Forecasting*, 31(3), pp.992-1007.

Hyung, Z., Lee, K. and Lee, K. (2014). Music recommendation using text analysis on song requests to radio stations. *Expert Systems with Applications*, 41(5), pp.2608-2618.

Ibrahim, N.F., Wang, X. and Bourne, H., (2017). Exploring the effect of user engagement in online brand communities: Evidence from Twitter. *Computers in Human Behavior*, 72, pp.321-338.

Ireland, R.D., Hoskisson, R.E., and Hitt, M.A. (2012.) *Understanding business strategy*, 3rd ed. Cengage Learning.

Iyer, G., and Katona, Z. (2015). Competing for attention in social communication markets. *Management Science*, 62(8), pp.2304-2320.

Jang, H., Sim, J., Lee, Y. and Kwon, O. (2013). Deep sentiment analysis: Mining the causality between personality-value-attitude for analyzing business ads in social media. *Expert Systems with Applications*, 40(18), pp.7492-7503.

Janssen, M., van der Voort, H., and Wahyudi, A. (2017). Factors influencing big data decision-making quality. *Journal of Business Research*, 70, 338-345.

Järvinen, J. and Karjaluoto, H. (2015). The use of Web analytics for digital marketing performance measurement. *Industrial Marketing Management*, 50, pp.117-127.

Jin, J., Liu, Y., Ji, P., and Liu, H. (2016). Understanding big consumer opinion data for market-driven product design. *International Journal of Production Research*, 54(10), pp.3019-3041.

Jin, X., Wah, B., Cheng, X. and Wang, Y. (2015). Significance and challenges of big data research. *Big Data Research*, 2(2), pp.59-64.

Johnson, S., Safadi, H. and Faraj, S. (2015). The emergence of online community leadership. *Information Systems Research*, 26(1), pp.165-187.

Jun, C. N., and Chung, C. J. (2016). Big data analysis of local government 3.0: Focusing on Gyeongsangbuk-do in Korea. *Technological Forecasting and Social Change*, 110, pp.3-12.

Kache, F., Kache, F., Seuring, S., and Seuring, S. (2017). Challenges and opportunities of digital information at the intersection of Big Data Analytics and supply chain management. *International Journal of Operations & Production Management*, 37(1), pp.10-36.

Kang, D. and Park, Y. (2014). Review-based measurement of customer satisfaction in mobile service: Sentiment analysis and VIKOR approach. *Expert Systems with Applications*, 41(4), pp.1041-1050.

Katal, A., Wazid, M. and Goudar, R.H. (2013). Big data: issues, challenges, tools and good practices, in *Contemporary Computing (IC3) 2013 Sixth International Conference*, pp. 404-409, IEEE.

Khan, F., Bashir, S. and Qamar, U. (2014). TOM: Twitter opinion mining framework using hybrid classification scheme. *Decision Support Systems*, 57, pp.245-257.

Kim, W. G., Lim, H., and Brymer, R. A. (2015). The effectiveness of managing social media on hotel performance. *International Journal of Hospitality Management*, 44, pp.165-171.

King, R., Racherla, P. and Bush, V. (2014). What we know and don't know about online word-of-mouth: A review and synthesis of the literature. *Journal of Interactive Marketing*, 28(3), pp.167-183.

Kiron, D. and Bean, R. (2013). Organizational alignment is key to big data success. *MIT Sloan Management Review*, 54(3), pp.1-6.

Kluemper, D. and Rosen, P. (2009). Future employment selection methods: evaluating social networking web sites. *Journal of Managerial Psychology*, 24(6), pp.567-580.

Költringer, C. and Dickinger, A. (2015). Analyzing destination branding and image from online sources: A web content mining approach. *Journal of Business Research*, 68(9), pp.1836-1843.

Kontopoulos, E., Berberidis, C., Dergiades, T. and Bassiliades, N. (2013). Ontology-based sentiment analysis of twitter posts. *Expert Systems with Applications*, 40(10), pp.4065-4074.

Kou, G. and Lou, C. (2012). Multiple factor hierarchical clustering algorithm for large scale web page and search engine clickstream data. *Annals of Operations Research*, 197(1), pp.123-134.

Krishnamoorthy, S. (2015). Linguistic features for review helpfulness prediction. *Expert Systems with Applications*, 42(7), pp.3751-3759.

Kumar, A., Bezawada, R., Rishika, R., Janakiraman, R., and Kannan, P. K. (2016). From social to sale: The effects of firm-generated content in social media on customer behavior. *Journal of Marketing*, 80(1), pp.7-25.

Kumar, A., Shankar, R., Choudhary, A., and Thakur, L. S. (2016). A big data MapReduce framework for fault diagnosis in cloud-based manufacturing. *International Journal of Production Research*, 54(23), pp.7060-7073.

Kumar, V., Choi, J. B., and Greene, M. (2016). Synergistic effects of social media and traditional marketing on brand sales: capturing the time-varying effects. *Journal of the Academy of Marketing Science*, pp.1-21.

Kwon, O., Lee, N. and Shin, B. (2014). Data quality management, data usage experience and acquisition intention of big data analytics. *International Journal of Information Management*, 34(3), pp.387-394.

Lam, S. K., Sleep, S., Hennig-Thurau, T., Sridhar, S., and Saboo, A. R. (2017). Leveraging frontline employees' small data and firm-level big data in frontline management an absorptive capacity perspective. *Journal of Service Research*, 20(1), pp.12-28.

Laney, D. (2001). 3-D data management: controlling data volume, velocity and variety, *META Group Research Note*, 6, available at http://blogs.gartner.com/doug-laney/files/2012/01/ad949-3D-Data-Management-Controlling-Data-Volume-Velocity-and-Variety.pdf (accessed 11 March 2015).

Lau, R. Y., Liao, S. S., Wong, K. F., and Chiu, D. K. (2012). Web 2.0 environmental scanning and adaptive decision support for business mergers and acquisitions, *MIS Quarterly*, 36(4), pp. 1239-1268.

Lavertu, S. (2015). We all need help: "Big data" and the mismeasure of public administration, *Public Administration Review*, 76(6), pp.864-872.

Lee, C. and Wang, S. (2012). An information fusion approach to integrate image annotation and text mining methods for geographic knowledge discovery. *Expert Systems with Applications*, 39(10), pp.8954-8967.

Lee, C., Yang, H. and Wang, S. (2011). An image annotation approach using location references to enhance geographic knowledge discovery. *Expert Systems with Applications*, 38(11), pp.13792-13802.

Lee, T. and BradLow, E. (2011). Automated marketing research using online customer reviews. *Journal of Marketing Research*, 48(5), pp.881-894.

Lee, W. (2007). Deploying personalized mobile services in an agent-based environment. *Expert Systems with Applications*, 32(4), pp.1194-1207.

Lee, Y. and Song, S. (2010). An empirical investigation of electronic word-of-mouth: Informational motive and corporate response strategy. *Computers in Human Behavior*, 26(5), pp.1073-1080.

Lee, Y., Hosanagar, K. and Tan, Y. (2015). Do I follow my friends or the crowd? Information cascades in online movie ratings. *Management Science*, 61(9), pp.2241-2258.

Leeflang, P., Verhoef, P., Dahlström, P. and Freundt, T. (2014). Challenges and solutions for marketing in a digital era. *European Management Journal*, 32(1), pp.1-12.

Lev-On, A., and Steinfeld, N. (2015). Local engagement online: Municipal Facebook pages as hubs of interaction. *Government Information Quarterly*, 32(3), pp.299-307.

Li, D. and Wang, X. (2015). Dynamic supply chain decisions based on networked sensor data: an application in the chilled food retail chain. *International Journal of Production Research*, pp.1-15.

Li, J., Li, X., and Zhu, B. (2016). User opinion classification in social media: A global consistency maximization approach. *Information & Management*, 53(8), pp.987-996.

Li, J., Wang, H. and Bai, X. (2015). An intelligent approach to data extraction and task identification for process mining. *Information Systems Frontiers*, 17(6), pp.1195-1208.

Li, K. and Du, T. (2012). Building a targeted mobile advertising system for location-based services. *Decision Support Systems*, 54(1), pp.1-8.

Li, N. and Wu, D. (2010). Using text mining and sentiment analysis for online forums hotspot detection and forecast. *Decision Support Systems*, 48(2), pp.354-368.

Li, Y., Lin, L. and Chiu, S. (2014). Enhancing targeted advertising with social context endorsement. *International Journal of Electronic Commerce*, 19(1), pp.99-128.

Liao, J., Yang, D., Li, T., Wang, J., Qi, Q. and Zhu, X. (2014). A scalable approach for content based image retrieval in cloud datacenter. *Information Systems Frontiers*, 16(1), pp.129-141.

Liu, S. Q., and Mattila, A. S. (2017). Airbnb: Online targeted advertising, sense of power, and consumer decisions. *International Journal of Hospitality Management*, 60, pp.33-41.

Liu, X., Singh, P. V., and Srinivasan, K. (2016). A structured analysis of unstructured big data by leveraging cloud computing. *Marketing Science*, 35(3), pp.363-388.

Lo, S. (2008). Web service quality control based on text mining using support vector machine. *Expert Systems with Applications*, 34(1), pp.603-610.

Lohr, S. (2012). The age of big data. *New York Times* [Online], 11 February, (accessed 11 March 2015), available at http://www.nytimes.com/2012/02/12/sunday-review/big-datas-impact-in-the-world.html,

Lu, Y., Jerath, K. and Singh, P. (2013). The emergence of opinion leaders in a networked online community: A dyadic model with time dynamics and a heuristic for fast estimation. *Management Science*, 59(8), pp.1783-1799.

Ludwig, S., de Ruyter, K., Friedman, M., Brüggen, E., Wetzels, M. and Pfann, G. (2013). More than words: The influence of affective content and linguistic style matches in online reviews on conversion rates. *Journal of Marketing*, 77(1), pp.87-103.

Ludwig, S., De Ruyter, K., Mahr, D., Wetzels, M., Brüggen, E. and De Ruyck, T. (2014). Take their word for it: The symbolic role of linguistic style matches in user communities. *MIS Quarterly*, 38(4), pp.1201-1217.

Luo, X., Andrews, M., Fang, Z. and Phang, C.W. (2013). Mobile targeting. *Management Science*, 60(7), pp.1738-1756.

Luo, X., Zhang, J. and Duan, W. (2013). Social media and firm equity value. *Information Systems Research*, 24(1), pp.146-163.

Malthouse, E., Haenlein, M., Skiera, B., Wege, E. and Zhang, M. (2013). Managing customer relationships in the social media era: Introducing the social CRM house. *Journal of Interactive Marketing*, 27(4), pp.270-280.

Manyika, J., Chui, M., Brown, B., Bughin, J., Dobbs, R., Roxburgh, C. and Byers, A.H., 2011. Big data: The next frontier for innovation, competition, and productivity, McKinsey Global Institute

Marcus, B., Machilek, F. and Schütz, A. (2006). Personality in cyberspace: Personal web sites as media for personality expressions and impressions. *Journal of Personality and Social Psychology*, 90(6), pp.1014-1031.

Mariani, M. M., Di Felice, M., and Mura, M. (2016). Facebook as a destination marketing tool: Evidence from Italian regional destination management organizations. *Tourism Management,* 54, pp.321-343.

Marrese-Taylor, E., Velásquez, J. and Bravo-Marquez, F. (2014). A novel deterministic approach for aspect-based opinion mining in tourism products reviews. *Expert Systems with Applications*, 41(17), pp.7764-7775.

Marston, S., Li, Z., Bandyopadhyay, S., Zhang, J. and Ghalsasi, A. (2011). Cloud computing — The business perspective. *Decision Support Systems*, 51(1), pp.176-189.

Martens, D., Provost, F., Clark, J., and Junqué de Fortuny, E. (2016). Mining massive fine-grained behavior data to improve predictive analytics. *MIS Quarterly*, 40(4), pp.869-888.

Matthias, O., Matthias, O., Fouweather, I., Fouweather, I., Gregory, I., Gregory, I., ... and Vernon, A. (2017). Making sense of Big Data–can it transform operations management?. *International Journal of Operations & Production Management*, 37(1), pp.37-55.

Mauri, A. and Minazzi, R. (2013). Web reviews influence on expectations and purchasing intentions of hotel potential customers. *International Journal of Hospitality Management*, 34, pp.99-107.

Mayer-Schönberger, V., and Cukier, K. (2013). *Big Data: a revolution that will transform how we live, work and think*. London: John Murray.

Mayzlin, D. (2006). Promotional Chat on the Internet. *Marketing Science*, 25(2), pp.155-163.

Mayzlin, D. and Yoganarasimhan, H. (2012). Link to success: How blogs build an audience by promoting rivals. *Management Science*, 58(9), pp.1651-1668.

McAfee, A. and Brynjolfsson, E. (2012). Big data: The management revolution, *Harvard Business Review,* 90(10), pp. 60-68.

Menon, S., and Sarkar, S. (2016). Privacy and big data: Scalable approaches to sanitize large transactional databases for sharing. *MIS Quarterly*, 40(4), pp.963-981.

Miller, A. and Tucker, C. (2013). Active social media management: The case of health care. *Information Systems Research*, 24(1), pp.52-70.

Moe, W. and Trusov, M. (2011). The value of social dynamics in online product ratings forums. *Journal of Marketing Research*, 48(3), pp.444-456.

Moon, S., Park, Y. and Seog Kim, Y. (2014). The impact of text product reviews on sales. *European Journal of Marketing*, 48(11/12), pp.2176-2197.

Moro, S., Rita, P., and Vala, B. (2016). Predicting social media performance metrics and evaluation of the impact on brand building: A data mining approach. *Journal of Business Research*, 69(9), pp.3341-3351.

Mortenson, M., Doherty, N. and Robinson, S. (2015). Operational research from Taylorism to Terabytes: A research agenda for the analytics age. *European Journal of Operational Research*, 241(3), pp.583-595.

Mostafa, M. (2013). More than words: Social networks' text mining for consumer brand sentiments. *Expert Systems with Applications*, 40(10), pp.4241-4251.

Mount, M. and Martinez, M. (2014). social media: A tool for open innovation. *California Management Review*, 56(4), pp.124-143.

Nam, H. and Kannan, P. (2014). The informational value of social tagging networks. *Journal of Marketing*, 78(4), pp.21-40.

Nassirtoussi, A.K., Aghabozorgi, S., Ying Wah, T. and Ngo, D. (2014). Text mining for market prediction: A systematic review. *Expert Systems with Applications*, 41(16), pp.7653-7670.

Nassirtoussi, A.K., Aghabozorgi, S., Ying Wah, T. and Ngo, D. (2015). Text mining of news-headlines for FOREX market prediction: A multi-layer dimension reduction algorithm with semantics and sentiment. *Expert Systems with Applications*, 42(1), pp.306-324.

Netzer, O., Feldman, R., Goldenberg, J. and Fresko, M. (2012). Mine your own business: Market-structure surveillance through text mining. *Marketing Science*, 31(3), pp.521-543.

Ngo-Ye, T. and Sinha, A. (2014). The influence of reviewer engagement characteristics on online review helpfulness: A text regression model. *Decision Support Systems*, 61, pp.47-58.

Nguyen, B., Yu, X., Melewar, T. and Chen, J. (2015). Brand innovation and social media: Knowledge acquisition from social media, market orientation, and the moderating role of social media strategic capability. *Industrial Marketing Management*, 51, pp.11-25.

Nichols, W. (2013). Advertising analytics 2.0. *Harvard Business Review*, 91(3), pp.60-68.

Noh, H., Jo, Y. and Lee, S. (2015). Keyword selection and processing strategy for applying text mining to patent analysis. *Expert Systems with Applications*, 42(9), pp.4348-4360.

Oestreicher-Singer, G. and Sundararajan, A. (2012). The visible hand? Demand effects of recommendation networks in electronic markets. *Management Science*, 58(11), pp.1963-1981.

Oh, C., Roumani, Y., Nwankpa, J. K., and Hu, H. F. (2017). Beyond likes and tweets: Consumer engagement behavior and movie box office in social media. *Information & Management*, 54(1), pp.25-37.

Okazaki, S. and Taylor, C. (2013). Social media and international advertising: theoretical challenges and future directions. *International Marketing Review*, 30(1), pp.56-71.

Opresnik, D., and Taisch, M. (2015). The value of big data in servitization. *International Journal of Production Economics*, 165, pp.174-184.

Ordenes, F., Theodoulidis, B., Burton, J., Gruber, T. and Zaki, M. (2014). Analyzing customer experience feedback using text mining: A linguistics-based approach. *Journal of Service Research*, 17(3), pp.278-295.

Orlikowski, W. and Scott, S. (2014). What happens when evaluation goes online? Exploring apparatuses of valuation in the travel sector. *Organization Science*, 25(3), pp.868-891.

Özyurt, Ö. and Köse, C. (2010). Chat mining: Automatically determination of chat conversations' topic in Turkish text based chat mediums. *Expert Systems with Applications*, 37(12), pp.8705-8710.

Pagani, M., and Malacarne, G. (2017). Experiential engagement and active vs. passive behavior in mobile location-based social networks: The moderating role of privacy. *Journal of Interactive Marketing*, 37, pp.133-148.

Panagiotopoulos, P., Barnett, J., Bigdeli, A. Z., and Sams, S. (2016). Social media in emergency management: Twitter as a tool for communicating risks to the public. *Technological Forecasting and Social Change*, 111, pp.86-96.

Pournarakis, D. E., Sotiropoulos, D. N., and Giaglis, G. M. (2017). A computational model for mining consumer perceptions in social media. *Decision Support Systems*, 93, pp.98-110.

Prates, J., Fritzen, E., Siqueira, S., Braz, M. and de Andrade, L. (2013). Contextual web searches in Facebook using learning materials and discussion messages. *Computers in Human Behavior*, 29(2), pp.386-394.

Provost, F. and Fawcett, T. (2013). Data science and its relationship to big data and data-driven decision making. *Big Data*, 1(1), pp.51-59.

Qi, J., Zhang, Z., Jeon, S., and Zhou, Y. (2016). Mining customer requirements from online reviews: A product improvement perspective. *Information & Management*, 53(8), pp.951-963.

Rapp, A., Beitelspacher, L., Grewal, D. and Hughes, D. (2013). Understanding social media effects across seller, retailer, and consumer interactions. *Journal of the Academy of Mareting Science*, 41(5), pp.547-566.

Ren, S. J., Wamba, S. F., Akter, S., Dubey, R., and Childe, S. J. (2016). Modelling quality dynamics, business value and firm performance in a big data analytics environment. *International Journal of Production Research*, pp.1-16.

Rifkin, J. (2014). *The zero marginal cost society: The Internet of things, the collaborative commons, and the eclipse of capitalism*. Hampshire, UK: Palgrave Macmillan.

Risius, M., and Beck, R. (2015). Effectiveness of corporate social media activities in increasing relational outcomes. *Information & Management*, 52(7), pp.824-839.

Roth, P., Bobko, P., Van Iddekinge, C. and Thatcher, J. (2013). Social media in employee-selection-related decisions: A research agenda for uncharted territory. *Journal of Management*, 42(1), pp.269-298.

Russom, P. (2011). *Big data analytics*. TDWI Best Practices Report, Fourth Quarter.

Rust, R. and Huang, M. (2014). The service revolution and the transformation of marketing science. *Marketing Science*, 33(2), pp.206-221.

Sabnis, G. and Grewal, R. (2015). Cable news wars on the Internet: competition and user-generated content. *Information Systems Research*, 26(2), pp.301-319.

Saboo, A. R., Kumar, V., and Park, I. (2016). Using big data to model time-varying effects for marketing resource (re) allocation. *MIS Quarterly*, 40(4), pp.911-939.

Salehan, M., and Kim, D. J. (2016). Predicting the performance of online consumer reviews: A sentiment mining approach to big data analytics. *Decision Support Systems*, 81, pp. 30-40.

Schäfer, K. and Kummer, T. (2013). Determining the performance of website-based relationship marketing. *Expert Systems with Applications*, 40(18), pp.7571-7578.

Schneider, M. J., and Gupta, S. (2016). Forecasting sales of new and existing products using consumer reviews: A random projections approach. *International Journal of Forecasting,* 32(2), pp.243-256.

Schniederjans, D., Cao, E. and Schniederjans, M. (2013). Enhancing financial performance with social media: An impression management perspective. *Decision Support Systems*, 55(4), pp.911-918.

Schweidel, D. and Moe, W. (2014). Listening in on social media: A Joint model of sentiment and venue format choice. *Journal of Marketing Research*, 51(4), pp.387-402.

Scullion, H., and Linehan, M. (Eds.) (2005). *International human resource management*. London: Palgrave.

Seddon, J. J., and Currie, W. L. (2017). A model for unpacking big data analytics in high-frequency trading. *Journal of Business Research*, 70, pp.300-307.

Shah, N., Irani, Z., and Sharif, A. M. (2017). Big data in an HR context: Exploring organizational change readiness, employee attitudes and behaviors. *Journal of Business Research*, 70, pp.366-378.

Shankar, V., Kleijnen, M., Ramanathan, S., Rizley, R., Holland, S., and Morrissey, S. (2016). Mobile shopper marketing: Key issues, current insights, and future research avenues. *Journal of Interactive Marketing*, 34, pp.37-48.

Shen, G. C. C., Chiou, J. S., Hsiao, C. H., Wang, C. H., and Li, H. N. (2016). Effective marketing communication via social networking site: The moderating role of the social tie. *Journal of Business Research*, 69(6), 2265-2270.

Short, J. (2009). The art of writing a review article. *Journal of Management*, 35(6), pp.1312-1317.

Shriver, S., Nair, H. and Hofstetter, R. (2013). Social ties and user-generated content: Evidence from an online social network. *Management Science*, 59(6), pp.1425-1443.

Singh, J. P., Irani, S., Rana, N. P., Dwivedi, Y. K., Saumya, S., and Roy, P. K. (2017). Predicting the "helpfulness" of online consumer reviews. *Journal of Business Research*, 70, pp.346-355.

Singh, P., Sahoo, N. and Mukhopadhyay, T. (2014). How to attract and retain readers in enterprise blogging?. *Information Systems Research*, 25(1), pp.35-52.

Singh, S., Hillmer, S. and Wang, Z. (2011). Efficient methods for sampling responses from large-scale qualitative data. *Marketing Science*, 30(3), pp.532-549.

Sivarajah, U., Kamal, M. M., Irani, Z., and Weerakkody, V. (2017). Critical analysis of big data challenges and analytical methods. *Journal of Business Research*, 70, pp.263-286.

Sonnier, G., McAlister, L. and Rutz, O. (2011). A dynamic model of the effect of online communications on firm sales. *Marketing Science*, 30(4), pp.702-716.

Sparks, B. and Browning, V. (2011). The impact of online reviews on hotel booking intentions and perception of trust. *Tourism Management*, 32(6), pp.1310-1323.

Sridhar, S. and Srinivasan, R. (2012). Social influence effects in online product ratings. *Journal of Marketing*, 76(5), pp.70-88.

Suh, J., Park, C. and Jeon, S. (2010). Applying text and data mining techniques to forecasting the trend of petitions filed to e-People. *Expert Systems with Applications*, 37(10), pp.7255-7268.

Sun, M. (2012). How does the variance of product ratings matter?. *Management Science*, 58(4), pp.696-707.

Tambe, P. (2014). Big data investment, skills, and firm value. *Management Science*, 60(6), pp.1452-1469.

Tan, K., Zhan, Y., Ji, G., Ye, F. and Chang, C. (2015). Harvesting big data to enhance supply chain innovation capabilities: An analytic infrastructure based on deduction graph. *International Journal of Production Economics*, 165, pp.223-233.

Tang, C. and Guo, L. (2015). Digging for gold with a simple tool: Validating text mining in studying electronic word-of-mouth (eWOM) communication. *Marketing Letters*, 26(1), pp.67-80.

Thorleuchter, D. and Van den Poel, D. (2012). Predicting e-commerce company success by mining the text of its publicly-accessible website. *Expert Systems with Applications*, 39(17), pp.13026-13034.

Thorleuchter, D. and Van den Poel, D. (2013). Web mining based extraction of problem solution ideas. *Expert Systems with Applications*, 40(10), pp.3961-3969.

Thorleuchter, D., Van den Poel, D. and Prinzie, A. (2010). Mining ideas from textual information. *Expert Systems with Applications*, 37(10), pp.7182-7188.

Thorleuchter, D., Van den Poel, D. and Prinzie, A. (2012). Analyzing existing customers' websites to improve the customer acquisition process as well as the profitability prediction in B-to-B marketing. *Expert Systems with Applications*, 39(3), pp.2597-2605.

Tirunillai, S. and Tellis, G. (2014). Mining marketing meaning from online chatter: Strategic brand analysis of big data using latent dirichlet allocation. *Journal of Marketing Research*, 51(4), pp.463-479.

Toubia, O., and Netzer, O. (2017). Idea Generation, creativity, and prototypicality. *Marketing Science*, 36(1), pp.1-20.

Tripp, T.M. and Grégoire, Y. (2011). When unhappy customers strike back on the Internet. *MIT Sloan Management Review*, 52(3), p.37.

Trusov, M., Ma, L., and Jamal, Z. (2016). Crumbs of the cookie: User profiling in customer-base analysis and behavioral targeting. *Marketing Science*, 35(3), pp.405-426.

Ur-Rahman, N. and Harding, J. (2012). Textual data mining for industrial knowledge management and text classification: A business oriented approach. *Expert Systems with Applications*, 39(5), pp.4729-4739.

van Doorn, J., Lemon, K., Mittal, V., Nass, S., Pick, D., Pirner, P. and Verhoef, P. (2010). Customer engagement behavior: Theoretical foundations and research directions. *Journal of Service Research*, 13(3), pp.253-266.

Van Iddekinge, C., Lanivich, S., Roth, P. and Junco, E. (2016). Social media for selection? Validity and adverse impact potential of a Facebook-based assessment. *Journal of Management*, 42(7), pp.1811-1835.

van Noort, G. and Willemsen, L. (2012). Online damage control: The effects of proactive versus reactive webcare interventions in consumer-generated and brand-generated platforms. *Journal of Interactive Marketing*, 26(3), pp.131-140.

VanMeter, R. A., Grisaffe, D. B., and Chonko, L. B. (2015). Of "Likes" and "Pins": The effects of consumers' attachment to social media. *Journal of Interactive Marketing*, 32, pp.70-88.

Vasarhelyi, M., Kogan, A. and Tuttle, B. (2015). Big data in accounting: An overview. *Accounting Horizons*, 29(2), pp.381-396.

Vermeulen, I. and Seegers, D. (2009). Tried and tested: The impact of online hotel reviews on consumer consideration. *Tourism Management*, 30(1), pp.123-127.

Vila, J., and Gomez, Y. (2016). Extracting business information from graphs: An eye tracking experiment. *Journal of Business Research*, 69(5), pp.1741-1746.

Wamba, S. F., Gunasekaran, A., Akter, S., Ren, S. J. F., Dubey, R., and Childe, S. J. (2017). Big data analytics and firm performance: Effects of dynamic capabilities. *Journal of Business Research*, 70, pp.356-365.

Wamba, S.F., Akter, S., Edwards, A., Chopin, G. and Gnanzou, D. (2015). How 'big data' can make big impact: Findings from a systematic review and a longitudinal case study. *International Journal of Production Economics*, 165, pp.234-246.

Wang, C., Lu, J. and Zhang, G. (2007). Mining key information of web pages: A method and its application. *Expert Systems with Applications*, 33(2), pp.425-433.

Wang, D., Zhu, S. and Li, T. (2013). SumView: A Web-based engine for summarizing product reviews and customer opinions. *Expert Systems with Applications*, 40(1), pp.27-33.

Wang, G., Gunasekaran, A., Ngai, E. W., and Papadopoulos, T. (2016). Big data analytics in logistics and supply chain management: Certain investigations for research and applications. *International Journal of Production Economics*, 176, pp.98-110.

Wang, K., Ting, I. and Wu, H. (2013). Discovering interest groups for marketing in virtual communities: An integrated approach. *Journal of Business Research*, 66(9), pp.1360-1366.

Wang, Y., and Hajli, N. (2017). Exploring the path to big data analytics success in healthcare. *Journal of Business Research*, 70, pp.287-299.

Webster, J. and Watson, R.T. (2002). Analyzing the past to prepare for the future: Writing a. *MIS Quarterly*, 26(2), pp.13-23.

Wei, C., Chiang, R. and Wu, C. (2006). Accommodating individual preferences in the categorization of documents: A personalized clustering approach. *Journal of Management Information Systems*, 23(2), pp.173-201.

Wei, C., Hu, P., Tai, C., Huang, C. and Yang, C. (2007). Managing word mismatch problems in information retrieval: A topic-based query expansion approach. *Journal of Management Information Systems*, 24(3), pp.269-295.

Wei, C., Yang, C. and Hsiao, H. (2008). A collaborative filtering-based approach to personalized document clustering. *Decision Support Systems*, 45(3), pp.413-428.

Wei, C., Yang, C. and Lin, C. (2008). A Latent Semantic Indexing-based approach to multilingual document clustering. *Decision Support Systems*, 45(3), pp.606-620.

Welch, E. W., Feeney, M. K., and Park, C. H. (2016). Determinants of data sharing in US city governments. *Government Information Quarterly*, 33(3), pp.393-403.

Woerner, S. and Wixom, B. (2015). Big data: Extending the business strategy toolbox. *Journal of Information Technology*, 30(1), pp.60-62.

Wu, J., Li, H., Cheng, S., and Lin, Z. (2016). The promising future of healthcare services: When big data analytics meets wearable technology. *Information & Management*, 53(8), pp.1020-1033.

Wu, L. (2013). Social network effects on productivity and job security: Evidence from the adoption of a social networking tool. *Information Systems Research*, 24(1), pp.30-51.

Xiang, Z., Du, Q., Ma, Y., and Fan, W. (2017). A comparative analysis of major online review platforms: Implications for social media analytics in hospitality and tourism. *Tourism Management*, 58, pp.51-65.

Xiang, Z., Schwartz, Z., Gerdes, J. H., and Uysal, M. (2015). What can big data and text analytics tell us about hotel guest experience and satisfaction?. *International Journal of Hospitality Management*, 44, pp.120-130.

Xie, K. L., So, K. K. F., and Wang, W. (2017). Joint effects of management responses and online reviews on hotel financial performance: A data-analytics approach. *International Journal of Hospitality Management,* 62, pp.101-110.

Xie, K., Wu, Y., Xiao, J., and Hu, Q. (2016). Value co-creation between firms and customers: The role of big data-based cooperative assets. *Information & Management*, 53(8), pp. 1034-1048.

Xu, J., Forman, C., Kim, J. and Van Ittersum, K. (2014). News media channels: Complements or substitutes? Evidence from mobile phone usage. *Journal of Marketing*, 78(4), pp.97-112.

Xu, Z., Frankwick, G. L., and Ramirez, E. (2016). Effects of big data analytics and traditional marketing analytics on new product success: A knowledge fusion perspective. *Journal of Business Research*, 69(5), pp.1562-1566.

Yang, H. (2009). Automatic generation of semantically enriched web pages by a text mining approach. *Expert Systems with Applications*, 36(6), pp.9709-9718.

Yang, H. and Lee, C. (2008). Image semantics discovery from web pages for semantic-based image retrieval using self-organizing maps. *Expert Systems with Applications*, 34(1), pp.266-279.

Yang, W., Cheng, H. and Dia, J. (2008). A location-aware recommender system for mobile shopping environments. *Expert Systems with Applications*, 34(1), pp.437-445.

Ye, Q., Law, R. and Gu, B. (2009). The impact of online user reviews on hotel room sales. *International Journal of Hospitality Management*, 28(1), pp.180-182.

Ye, Q., Zhang, Z. and Law, R. (2009). Sentiment classification of online reviews to travel destinations by supervised machine learning approaches. *Expert Systems with Applications*, 36(3), pp.6527-6535.

Yeh, I., Lien, C., Ting, T. and Liu, C. (2009). Applications of web mining for marketing of online bookstores. *Expert Systems with Applications*, 36(8), pp.11249-11256.

Yoon, J. (2012). Detecting weak signals for long-term business opportunities using text mining of Web news. *Expert Systems with Applications*, 39(16), pp.12543-12550.

Yu, Y., Duan, W. and Cao, Q. (2013). The impact of social and conventional media on firm equity value: A sentiment analysis approach. *Decision Support Systems*, 55(4), pp.919-926.

Yuan, H., Lau, R. Y., and Xu, W. (2016). The determinants of crowdfunding success: A semantic text analytics approach. *Decision Support Systems*, 91, pp.67-76.

Zeng, J., Wu, C. and Wang, W. (2010). Multi-grain hierarchical topic extraction algorithm for text mining. *Expert Systems with Applications*, 37(4), pp.3202-3208.

Zhan, J., Loh, H. and Liu, Y. (2009). Gather customer concerns from online product reviews – A text summarization approach. *Expert Systems with Applications*, 36(2), pp.2107-2115.

Zhan, Y., Tan, K.H., Li, Y. and Tse, Y.K., 2016. Unlocking the power of big data in new product development. *Annals of Operations Research*, pp.1-19.

Zhang, X., Li, S., Burke, R. and Leykin, A. (2014). An examination of social influence on shopper behavior using video tracking data. *Journal of Marketing*, 78(5), pp.24-41.

Zhang, Y. and Jiao, J. (2007). An associative classification-based recommendation system for personalization in B2C e-commerce applications. *Expert Systems with Applications*, 33(2), pp.357-367.

Zhong, R. Y., Huang, G. Q., Lan, S., Dai, Q. Y., Chen, X., and Zhang, T. (2015). A big data approach for logistics trajectory discovery from RFID-enabled production data. *International Journal of Production Economics*, 165, pp.260-272.

Zhou, Z., Dou, W., Jia, G., Hu, C., Xu, X., Wu, X., and Pan, J. (2016). A method for real-time trajectory monitoring to improve taxi service using GPS big data. *Information & Management*, 53(8), pp.964-977.

Zhu, F. and Zhang, X. (2010). Impact of online consumer reviews on sales: The moderating role of product and consumer characteristics. *Journal of Marketing*, 74(2), pp.133-148.

Zissis, D. and Lekkas, D. (2011). Securing e-Government and e-Voting with an open cloud computing architecture. *Government Information Quarterly*, 28(2), pp.239-251.